FOREIGN POLICY PROBLEM REPRESENTATION
AND PRESIDENT CARTER

DISSERTATION

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1994
To all who have watched over me and supported my endeavors.
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CHAPTER I

INTRODUCTION

Why study President Carter?

Many theories of international relations dismiss individuals as unimportant sources for the explanation of state behavior or, to the extent they recognize that individuals do count, consider their impact unmeasurable. A difficulty for these structural and state level theories of international relations is the change in the foreign policy behavior of the United States during the administration of President Jimmy Carter. Carter’s foreign aid policy to Nicaragua and other states provides a dramatic example of this change. (Dumbrell 1993: 150-161; Ambrose 1990:301-302)

Dictator Anastasio Somoza of Nicaragua had been a long term U.S. ally and had enjoyed the support of the Nixon and Ford administrations, despite the oppressive nature of his regime. This friendly relationship soon changed under Carter. The Carter Administration began a review of aid to Nicaragua almost immediately upon taking office and it soon became clear that continued U.S. aid would depend on significant improvements in human rights. On February 10, 1979 the U.S. suspended military aid and began to exert pressure to oust Somoza. By the end of July the Somoza regime had been replace by the Sandinistas who despite Marxist overtones gained favor with Carter\(^1\) and the

\(^1\) Dumbrell (1993) provides a convincing excerpt from a letter, date February 25, 1980, from Carter to Senator D. Inouye, Chairman of the Senate Appropriations subcommittee on Foreign Operations.
Administration. This dramatic turnaround in United States policy allowed candidate Ronald Reagan to effectively characterize Carter as a supporter of America’s enemies.

However, towards the end of his term, Carter’s foreign policy moved away from the initial emphasis on human rights and toward a more familiar focus on the Soviet Union and United States’ security in a hostile world. This change may have begun as early as his second year in office, in response to events in Africa, including Soviet-Cuban involvement in Angola and the war in Somalia, and appears to have been complete following the hostage taking in Iran and the Soviet entry into Afghanistan. During 1980 for example, in addition to sanctions directed against the Soviet Union and Iran, Carter requested a increase of $15 billion dollars in 1981 defense spending, producing an overall increase rather than decrease in defense spending, and, in contrast to earlier policy, exchanged military aid for access rights in Oman, Kenya, Somalia, and Turkey, and approved arms sales to Egypt, China, and Jordan (Rosati 1987/91). This turnaround in policy has been noted by many observers, of whom Stephen Ambrose is typical:

Carter had begun with a firm policy, a policy that in many ways held hope for a new beginning—lowered expenditures for armaments, greater trust between the two sides, more trade and more cultural exchanges, in short, a genuine détente. But he had been unable to hold to that policy ... By 1980, the word most often used to describe his foreign policy was “waffle.” It was a stinging indictment.

Ambrose 1990: 310

Just as intriguing as this change in policy during Carter’s term in office is the difference in Carter’s foreign policy behavior compared to the prior and succeeding administrations. Examples of the departure from the foreign policy behavior of previous administrations are numerous. In addition to changes in foreign aid policy illustrated above, in 1977 alone, the State Department charged Czechoslovakia with violations of the 1975 Helsinki Accords, Carter canceled weapons sales to Israel, and suspended foreign aid
payments to King Hussein of Jordan after 20 years. And perhaps the most incongruous Carter policy in the context of the United States’ previous relationship with the Soviet Union, was his cancellation of the B-1 bomber with no reciprocal move from the Soviet Union (Rosati 1987/91). These differences are an additional source of difficulty for structural and state theories of international relations.

Structural theories, such as Waltz’s descriptions of governing principles of the international system that dictate state behavior (Waltz 1979) look at the overall nature of the entire international system as the source of foreign policy behavior and would expect policy behavior to change only if the structure of the international system changed. State and sub-State level theories, such as the Correlates of War project which looks at the aspects of states that are associated with involvement in war (see for example Singer 1980) or Allison and Halperin’s bureaucratic decision making model (Allison and Halperin 1972) which analyses the machinery of foreign policy, would expect policy to change only if there were a change in the nature of the state or in the machinery of the bureaucracy. These perspectives on international relations would predict little or no change in the foreign policy behavior of the United States either during Carter’s term in office or in comparison to either the previous or succeeding administrations. The structure of the international system did not change, that is there were not major realignments of states or changes in the relative power distribution across the system, nor did the character of the United States itself perceptively change. And while there were changes in the appointed leaders of government agencies, in the structure of the administration, and in the creation of new agencies, such as the Department of Energy (Dumbrell 1995:4), to the extent that these created a new dynamic in the government, they reflected the interests and desires of the new President. Clearly, despite stability in the system and the state, the foreign policy of Jimmy Carter with his emphasis on Human Rights did not conform to the preceding emphasis on
competition with Soviet Union, or Ronald Reagan’s subsequent restoration of Cold War thinking.

The differences in foreign policy behavior within the Carter Administration and between the Carter Administration and other administrations suggest that there are more influences on foreign policy than accounted for by state and system level theories. Even if, as some theorists might suggest, Carter simply did not understand the “rules” of the international system and was browbeaten into conformity, an explanation of this process requires an investigation of Carter’s beliefs and perceptions not provided for by either state or system level theories. Given the observed change in Carter’s policy behavior, can we find a similar change in his beliefs and perceptions? One previous study of this question has been conducted by Jerel Rosati (1987/91:7-13). Rosati’s research involves a static thematic analysis of major policy speeches and begins to investigate this controversy by correlating representation of the international system contained in major policy speeches of Administration officials with policy behavior, but fails to investigate the processes that drove the changes in Carter’s behavior. Providing a more complete explanation of Carter’s policies and the change in his policies requires a different approach to international relations.
A Different Approach to International Relations

To aid our understanding of Carter’s foreign policy behavior, we might take heed of Charles Kegley Jr.’s prescription for understanding the end of the Cold War:

we, thus, will need to map the cognitive terrain of the actors in the process first. In this way we could describe the decision calculus ... and trace the balance between "opportunity and willingness" (Most and Starr, 1989: 23-46) in these policy makers' conceptualizations of the structural possibilities of their environments and their decision structures. From these data, we could estimate the accuracy of their images. And the images themselves could be placed into a dynamic process model that visualizes the contributing factors colliding and influencing one another at certain points and not at others, with some factors moving together but not affecting one another and other factors in constant interaction.

Kegley 1994: 35

However, Kegley’s prescription for the study of international relations is not new, it elaborates an existing prescription over thirty years old given by Snyder, Bruck, and Sapin:

It is difficult to see how we can account for specific actions and for continuities of policies without trying to discover how [decision makers] operating environment is perceived by those responsible for choices, how particular situations are structured, what values and norms are applied to certain kinds of problems, what matters are selected for attention and how their past experience conditions present responses. This would appear to be true even if our aim is the modest one of an adequate “understanding,” much less a predictive theory.

Snyder, Bruck and Sapin 1954/62:5

Both of these prescriptions are, as yet, unfilled. It is the goal of this project to ‘fill’ that prescription and investigate the processes that connect prior beliefs and foreign policy behavior by mapping the cognitive terrain of former President Jimmy Carter in the domain of foreign policy, looking at change in this terrain over time, and modeling the dynamic processes of decision making. The roots of this approach lie in the cognitively-oriented research program in the study of foreign policy which began after the publication of “Decision Making as an Approach to the Study of Foreign Policy” by Snyder, Bruck and
Sapin (1954/62). This research program has attempted to determine the impact of individual decision makers and decision making groups on events in the international arena and to discover the relationship between beliefs and foreign policy behavior in the manner called for by Kegley (see for example Holsti 1962 and Snyder and Paige 1958).

The monograph by Snyder, Bruck and Sapin established the core assumptions of the program and the ground rules for the study of Foreign Policy Decision Making. These assumptions include: a view of the state as an actor in a situation, a distinction between the subjectively defined world of the decision maker(s) in a decision unit and an objective reality. "It is one of our basic choices to take as our prime analytical objective the recreation of the "world" of the decision makers as they view it" (Snyder, Bruck, and Sapin 1954/62:65) A position reinforced by Harold and Margaret Sprout and Sprout with their parallel distinction between the psychological and operational environments of decision makers (Sprout and Sprout 1956). Furthermore, Snyder, Bruck and Sapin consider an occasion for decision to arise from uncertainty and to be characterized by a definition of the situation composed of perceptions and expectations, that is, the beliefs of the decision maker(s), leading to choices.

The assumption of an external reality independent of the decision maker and its distinction from an internal subjective reality is perhaps the most important conceptual distinction in the monograph, and this concern has been reflected in subsequent representational research (Tetlock and McGuire 1985, 86) on cognitive/belief structures that provide frameworks for integrating new information and for defining and selecting among policy options (Holsti 1962, Brecher 1972, Axelrod 1976, Cottam 1977, Herrmann 1988, Thorson and Sylvan 1992, Bonham, Parshin and Sergeev 1991). Many of these studies
include an assumption that the belief system acts as a "lens"\(^2\) through which the world is perceived, suggesting that the belief system transforms perceived stimuli before encoding them into memory.

Research in Political Science on belief structures that provide frameworks for integrating new information and for defining and selecting among policy options has come from a variety of perspectives which have operationalized beliefs in a variety of ways. Holsti's classic study (1962; 1970) for example, operationalized beliefs using evaluation assertion analysis based in attitude theory, which measures the strength of affect associated with concepts by an actor, and George (1969; see also Leites 1951, Holsti 1977, and Walker 1977) is well known for his use of the operational code construct, which seeks to assess a set of core philosophical and instrumental beliefs. Other research has approached beliefs in a less pre-structured manner and employed cognitive mapping techniques to assess actors' beliefs about the causal connections between concepts they recognize in their environment (Axelrod 1976, Bonham et al. 1978; Maoz and Shayer 1987). While all of these approaches have contributed to our understanding of the relationship between prior beliefs and behavior, the process by which beliefs become expressed in behavior is not yet clear.

More recent research in foreign policy decision making has shared with decision-making research in Psychology a focus on option generation and selection based on a pre-defined definition of the situation. Less attention has been given to the creation of definitions of the situation -- referred to as problem representations -- by decision makers.

\(^2\)Holsti (1962). Although the lens metaphor presents a vivid picture, the process of perception may be better considered as an integral part and consequence of the structure of the belief system. That is, perception should not be considered to be separate from understanding.
For example, studies on the Cuban missile Crisis, such as Thorson and Sylvan's (1982) study of Kennedy and his advisors, approach the task as one of reconstructing a choice over a set of alternatives, in effect constructing an evaluation function for the group (for the authors' reevaluation of this research see Sylvan and Thorson 1992). The validity of this function and its selected option is dependent on the correspondence of the posited problem representation for the group and the actual problem representation of the group. Similarly, in work by Hermann (1980) on the policies of various types of predominant leaders the solution predicted is dependent on leaders initial positions, where the initial positions are extracted from case materials and taken as givens for the model, this is also true for the group decision work of Stewart, Hermann and Hermann (1989). This conceptualization is increasingly coming into question as scholars focus on the initial positions of decision makers and emphasize the construction of a unique problem representation (or definition of the situation) by each decision maker, from which policy options are generated (Voss 1991; Voss et al 1991; Sylvan and Thorson 1992; Sergeev et al 1990). These scholars consider a problem representation to be composed of a problem solver's beliefs about the situation. Problem representation forms the interface between the prior beliefs of the decision maker and policy behavior.

The problem representation construct, which provides both a "conceptual map" and a "dynamic process" for decision making in foreign policy, is the starting point for this research. Problem representation as a construct has gained attention in the study of foreign policy as scholars have recognized that many policy makers create or modify problem representations as they encounter information from the international environment, even though some, like John Foster Dulles and his image of the Soviet Union, fit information to their existing representation (Holsti 1962; 1970). In a re-examination of their earlier study of the Cuban Missile Crisis, Sylvan and Thorson provide a more substantive example of
this problem representation behavior link. In this 1992 article, Sylvan and Thorson suggest that the Cuban Missile Crisis revolved around two incompatible problem representations. One definition, constructed by Khrushchev indicated that Soviet SS-4 nuclear missiles were defensive weapons, while the other definition of the situation, constructed by Kennedy and Excomm, indicated that any Soviet nuclear missiles in the western hemisphere capable of reaching the United States were offensive weapons, and therefore the SS-4’s in Cuba with a range of 500 miles were offensive weapons and a problem. This suggests that the intensity of the crisis was the result of one side perceiving a problem, and the genuine surprise of the other when the problem is acted upon very forcefully.

Unfortunately, while renewed attention is being paid to the problem representation construct there continues to be a lack of integrated research that reflects on the relationship between beliefs and policy behavior. While the problem representation construct is being investigated, problem representation as a process has not been subjected to analysis. This is in part because the process(es) of problem representation construction is presumed to employ highly individualized knowledge and in part because the problem representation construct has not been developed beyond broad conceptualizations. This dearth of research on the relationship between prior beliefs, decision making process, and in particular policy behavior is also found in the Psychology literature on problem solving and decision making and has left a gap in our ability to resolve conflicting interpretations of United States’ foreign policy behavior.

It is the premise of this project that this gap can be narrowed by operationalizing the problem representation construct in a specific manner and investigating cases of known or presumed changes in problem representations, with accompanying changes in policy behavior, such as Carter’s foreign policy. In these cases we can use information about
prior problem representations to theorize about the processes that produce a shift to a new representation which produces new behaviors, given some intervening event(s).

This dissertation first builds on the earlier work by exploring the problem representation construct, positing a relationship between beliefs and behavior, and operationalizing both the problem representation construct and the problem representation process. The developed model is then applied to the foreign policy behavior of former President Jimmy Carter. Beyond the concrete operationalization of problem representation and thereby mapping the cognitive terrain of President Carter and his decision making processes, the broader goal of this research is to understand the processes of individual problem representation and policy choice. This will provide a solid foundation for modeling the foreign policy behavior of small groups where, in addition to political issues, group dynamics, communication strategies, and unevenly distributed information further complicate the decision making process.
CHAPTER II

BETWEEN BELIEFS AND BEHAVIOR

It was suggested in the introduction, that the concept of a problem representation is the interface between the prior beliefs of a policy actor and his/her policy behavior. I also posit that policy behavior is a consequence of the representation of the policy problem. If this is true, then some questions must be addressed before Kegley’s (and Snyder, Bruck and Sapin’s) prescription can be filled: What is a problem representation? How are problem representations structured? and What is the role of problem representation in the decision making process? Following a discussion of each of these questions, this chapter ends with an overview of the research strategy which follows from the discussion and is carried out in the subsequent chapters.

What Is A Problem Representation?

Scholars working on the relationship between beliefs and behavior, and in particular on problem representation, fall generally into two groups, those who assume a social construction of reality (for example, that rules of etiquette exist to the extent that a community subscribes to those rules), and those who assume that at least some portion of reality can be objectively defined. In general, with regard to “problems” psychologists fall into the latter group and assume that problems can be objectively defined and therefore they tend to focus on studies of problem recognition and diagnosis (see for example Moreland and Levine 1992). On the other hand, many political scientists focusing on decision making, balk at this assumption and follow Snyder, Bruck, and Sapin (1954/62) in suggesting that problems do not objectively exist, rather some situations will be perceived.
as problems by one actor, while at the same time they may be perceived as opportunities (or not at all) by other actors. For these scholars, the focus of research tends to be on the active construction of a problem.

We assume that there is no "event" that becomes the decision-making context until the decision-maker constitutes the event by selecting out aspects of the environment for special attention. Events have natural boundaries only within the context of the old referential theory of meaning, a theory that assumed that the meaning of a concept is exhausted by the objects to which it refers. If we assume that part of the meaning of a concept inheres in the way it is being used, the boundaries which create events come from the conceptual systems of those who speak of the event.

Bonham and Shapiro 1977:6

The process of perception and the recognition/definition of a situation, in the cases of interest to many political scientists and in particular foreign policy analysts, has come to be known as problem representation (process) resulting in a problem representation (construct)\(^3\) at an individual level. Unfortunately, like many constructs throughout the social sciences, there is no widely accepted definition of problem representation\(^4\) across the many areas in which problem representation is studied (Psychology, Organizational Behavior, Political Science, and Political Psychology are some examples). However, while the definitions used across these disciplines tend to reflect the experimental paradigm of Psychology and assume an objective problem definition, they do have common features which can provide the basis for a well formed theoretical concept of problem representation that assumes an active construction and interpretation of "problems."

Premkumar (1989) for example, in a study of decision making in business, provides a broad definition of a problem representation as follows:

\(^3\) As will be shown later, problem representation as a construct becomes a specialization of definition of the situation (Snyder, Bruck, and Sapin 1954/62).

\(^4\) This was made very clear to me at an invited conference of about thirty participants representing Psychology and Political Science.
[A] problem representation is a cognitive structure corresponding to a problem, constructed by a solver on the basis of his domain\textsuperscript{5} related knowledge and its organization.

Premkumar 1989:559-60

This definition suggests several characteristics of problem representations that are useful as a starting point for a more complete definition:

1. Problem representations are cognitive structures.
2. Problem representations are constructed by individuals\textsuperscript{6} in response to a situation.
3. The structure of a problem representation is dependent on the content and organization of the beliefs of the individual.

Cowan (1986) presents a more restrictive definition, and provides one dimension of variation for problem representations: certainty, where, from the perspective of Bonham and Shapiro, certainty implies confidence rather than a correspondence with “reality.”

\textsuperscript{5}While Premkumar takes domains to be objectively defined, throughout this document, domains are assumed to be subjectively defined. This distinction does not in any way affect the use of Premkumar’s definition of problem representation.

\textsuperscript{6}While the discussion which follows refers to groups, I do not consider groups to have problem representations per se, although members of the groups may have overlapping sets of beliefs, including beliefs about other group member’s problem representations. This is considered to be true even in light of arguments that favor the social construction of reality, which I suggest represents the coordination of individual constructions of reality.
Problem description consists of identifying the factors involved in the problem situation, their relationships, and the consequences that are expected to ensue if the problem is left untreated. At the extremes, an individual may be entirely certain or entirely uncertain of a problem description, where certainty implies a clear understanding of the problem.

Cowan 1986:768

In addition, Moreland and Levine (1992) suggest that a problem representation process must occur prior to a problem solving process:

A problem representation is a mental model that includes a label for the problem, some ideas about why the problem occurred and how it might be solved, and a prediction about what will happen if the problem is ignored. Once a representation has been developed, the process of group problem solving can proceed.

Moreland and Levine 1992:21

Smith (1989), in an adaptation of Agre (1982), provides one of the more comprehensive definitions and suggests why a problem is a problem in contrast to an opportunity:

[A] problem is an undesirable situation that is significant to and may be solvable by some agent, although probably with difficulty. Key elements of this definition are the gap between preferences and reality, the importance of remedying this gap, and the expected difficulty of doing so. Problems are conceptual entities that don’t exist in the world, but rather involve a relationship of disharmony between reality and one’s preferences. While they involve external reality, problems are partially but intrinsically subjective: each person has his own beliefs, preferences, and capabilities. The problem construct was created for attention allocation purposes: by identifying problems, we focus attention in pursuit of our goals. A related construct “opportunity,” draws attention to potential goods.

Smith 1989:965-6

Moreland and Levine also suggest that problem representations have certain features, such as labels and symptoms. While I remain at the moment agnostic on the required features of a problem representation (see the chapters following), I find the disease analogy that drives this assertion too strong and the required features too suggestive of a diagnostic reasoning process for comfort.
Smith also explicitly states that problem representations will vary by individual due to differences in beliefs, preferences, and capabilities, a suggestion supported by Moreland and Levine (1992), and empirically confirmed by Premkumar (1989). One individual characteristic that has been studied fairly extensively in the Problem Solving literature, is the expert-novice distinction (Taylor 1975; Larkin, McDermott, Simon, and Simon 1980; Chi, Feltovich, and Glaser 1981; Adelson 1981; Vitalari 1985; Premkumar 1989; Lambert and Newsome 1989), and one result of these studies is that experts tend to use more abstract problem representations, while novices use more concrete ones. In research on computer programming for example, Lambert and Newsome (1989) characterize abstract and concrete problem representations in the following manner:

In general, an abstract conceptual representation of a problem can be thought of as a representation that includes information on what a particular problem means given its symptoms, including how the particular problem is related to a general domain or an overall class of problems. For example, the same solution can be reached using several different solution procedures. On the other hand, a concrete representation focuses on specific problem parameters (symptoms) or surface details of a problem statement (i.e. emphasizing how various computer components function). These distinctions can be considered as points along a concrete-abstract dimension.

Lambert and Newsome 1989:29

Problem representations also appear to vary in at least one other way; the presentation of a situation and the nature of the physical environment, all of which can be considered to be part of the context of the problem solver, can also influence the nature of an individual’s problem representation. For example, Kahneman and Tversky (1979:274-5), in an article on Prospect Theory, describe a process called editing which involves the construction of a frame for option evaluation. This process includes setting a reference point against which options will be evaluated. The editing process described by Kahneman and Tversky can also be considered to be the construction of a problem representation,
which they indicate is influenced by context; “the preference order between prospects need not be invariant across contexts, because the same prospect could be edited in different ways depending on the context in which it appears” (p. 275). In experiments on option evaluation based on Prospect Theory (e.g. Van Schie and Van Der Pligt 1990; Fischhoff 1983), the editing phase is usually not apparent as subjects appear to accept the framing given within the problem description. However, editing or problem representation is expected to be more important with stimuli which are ambiguous to the problem solver as is often the case in the interpretation of the international environment. Van Schie and Van Der Pligt in their study of frame preference suggest that “[i]n order to predict behavior in situations that do not explicitly impose a particular frame on the decision problem, one must be able to anticipate how problems will be represented and what frames people will use to interpret them” (1990:245, emphasis in the original). Van Schie and Van Der Pligt also suggest that once a particular problem frame is given, this frame will be used and subjects appear to be insensitive to other possible problem frames. (See also Tversky and Kahneman 1986.)

Support for contextual influences on problem representation is also found in a study by Kotovsky, Hayes, and Simon (1985) of why some formally equivalent problems (in terms of the branchiness of the problem space and depth of the solution) vary in difficulty (up to 16:1 in terms of solution time). Kotovsky et al. suggest that the differences in problem difficulty lie in “the manner in which the subject images or models or thinks about the problem” (p. 251, emphasis in the original). In other words to differences in the problem representations elicited by each problem statement. In this study Kotovsky et al. adopt the definition of a problem representation proposed by Newell and Simon (1972), in which a problem representation has two components, the problem space adopted (defined by the initial state the subject creates), and the operators that allow for movement between
states in the problem space. (The nature of the problem space is not apparent to the subject, but is defined by the combination of the initial state assumed and the operators recognized as valid.)

To summarize the psychologically oriented discussion on problem representation thus far, we can consider a problem representation to have the following characteristics:


3. The nature of the problem representation constructed by an individual is dependent on
   (a) the individuals knowledge and beliefs (Premkumar 1989; Smith 1989; Lambert and Newsome 1989; Moreland and Levine 1992), and
   (b) the context and nature of the stimulus (Kahneman and Tversky 1979; Kotovsky et al. 1985).

4. A problem representation contains an inference that a gap exists between the individual’s goals and the current perception of reality or the perception of future reality (Smith 1989).

5. Problem representations can be considered to vary on at least two measures\(^8\)
   (a) the degree of abstraction (Lambert and Newsome 1989), and
   (b) certainty or confidence (Cowan 1986).

---

\(^8\)The authors use the term ‘dimensions’, the term ‘measures’ reflects my agnosticism as to how humans reason about certainty and abstraction.
6. A problem solver must engage in a process (conscious, non-conscious, or both) of constructing a problem representation prior to a problem solving process. However, the problem representation may be revised during problem solving (Hayes and Simon 1974; Kahneman and Tversky 1979; Moreland and Levine 1992).

What is the Role of Problem Representation in Decision Making?

Within the political science literature it is increasingly recognized that problem representation (often referred to in the literature as the definition of the situation) forms the interface between prior beliefs and policy behavior. The effect of problem representation on behavior has been studied in a variety of ways discussed earlier, including operational code (for example Holsti 1962; 1970), cognitive maps (for example Walker and Watson 1992), and world views (for example Rosati 1987/91). However these analyses have been largely static and as suggested previously, the processes that connect belief system and problem representation and problem representation and behavior remain to be specified. While much of this research recognizes the dynamic nature of problem representation and the role of feedback, there has been a lull in development within Foreign Policy Analysis (Hudson 1992). During this lull research has continued in Psychology, and the role of problem representation in the decision making process is illustrated here in a model of human problem solving from Psychology by James Voss (1991).
As identified in Figure 1, the beliefs (including constraints and goals) of the decision maker (which, in total, we shall regard as a belief system) have an impact on the nature of the problem representation, and subsequently on the construction of a solution (policy intent). Once a solution is implemented and is translated into an outcome (policy enacted) by interaction with the environment, then either change in the representation or re-representation becomes possible based on feedback from the environment. In the model,
although any given feedback is considered to be perceived at the level of the belief system, it may be expressed as a change, or not at all, at any level of the model from belief system down to the decision output. Voss also concurs with Van Schie and Van der Plight (1990) in stating that problem representations often contain only a single solution and that alternatives may not be evaluated, hence the problem representation may determine the policy behavior. Currently missing from the model is any explicit treatment of affect and its role in the processes that connect beliefs and behavior. While it is recognized that affect may play an important role in these processes, explicit attention to affect is set aside for this study in the recognition that this would vastly increase the complexity of the task. To the extent that affect is included, it is in the use of a salience measure of belief importance which is used in the process models developed later.

The problem solving model described suggests the following framework, consistent with the six characteristics of problem representations. In this framework, the belief system of an individual includes three categories of beliefs; causal beliefs about the relationships between concepts, factual beliefs about the state of the world, and goals or a desired state of the world. Each of these categories of beliefs can be more or less firmly held, that is resistant to revision, and core beliefs are defined as those which are most resistant to revision, usually causal beliefs or goal beliefs. Core beliefs are expected to influence the structure of the rest of the belief system and of problem representations. Goal beliefs which are at the top of the goal hierarchy in a belief system are presumed to be firmly held core beliefs. All three types of beliefs are obviously highly interrelated, for example, goals are often based on what is believed to be true and/or believed to be possible. A belief system, composed of beliefs in these categories, interacts with a perception of a situation to produce a definition of the situation. Three types of definitions
of a situation are possible, either problems, neutral, or opportunities, depending on the inferences about the satisfaction of goals that follow from the representation of the situation.

1. Problem (threat) situation representations contain the causal beliefs (beliefs about the causal connections between concepts) and the factual beliefs (about the properties of concepts, and about goals and expectations) associated by the perceiver with the situation, which lead to an inference that some goal(s) is or will be frustrated.

2. Neutral situation representations contain the causal and factual beliefs associated by the perceiver with the situation and inferences from these beliefs indicate either that goals will be maintained at current levels of satisfaction, or that the situation is not connected to any currently held goals. To the extent that representation processes are non-conscious these representations may only rarely enter consciousness.

3. Opportunity situation representations contain the causal and factual beliefs associated by the perceiver with the situation, which lead to an inference that actions are or may be available to improve goal satisfaction.

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Jackson and Dutton (1988) suggest that there are certain problem characteristics that are diagnostic of problems (threat) and others that are diagnostic for opportunities, in particular they suggest that these characteristics correspond to features of schema held by organizational decision makers.
How Are Problem Representations Structured?

Now that we have determined what a problem representation is and its role in decision making, it is equally important to know how a problem representation is structured. Of course, since a problem representation is considered a cognitive construct we cannot actually view a problem representation directly. However, as a cognitive construct we might expect problem representations to be similar in structure to the overall structure of a belief system and how beliefs are stored in memory, therefore we can begin with plausible models of cognitive architecture.

In a review of cognitive architectures, Estes (1991) suggests that there are two parallel approaches to memory format in Psychology, the associative network model and the memory trace model. The structure of an associative network is a node and link structure, where a node is a concept (noun, object or adjective), such as ‘Cuba’ or ‘communist,’ and each link represents a relationship between nodes. There are three important features of this model of memory, the first being that links between nodes are associative. This model stipulates that links between nodes refer to associations between concepts, and that links can be established and strengthened by the occurrence of these associations in experience, that is when the links are activated by perception. The repeated observation that Cuba is communist, for example, may lead one to always think of communism whenever they think of Cuba. Secondly, these links are directional, in other words, any particular association is one-way between nodes, although a link in the opposite direction may exist. For example, while thinking of Cuba may lead to thoughts of communism, thoughts of communism may not necessarily lead to thoughts of Cuba. Lastly, the links between nodes in this model may be labeled, i.e., there are types of relational links (class membership etc.) between concepts. The concept ‘Cuba,’ for example may be associated via an ‘is-a’ relationship to the concept ‘communist-country,’ to
produce the belief ‘Cuba is-a communist-country.’ Figure 2 is a Cold War example which illustrates the associative network concept with four concepts and three relationships.

The network contains the following associations:
Cuba is a country.
Cuba is communist.
Cuba is a Soviet client.

The four concepts in this associative network are ‘country,’ ‘communist,’ ‘Cuba,’ and ‘Soviet-client.’ The concept ‘Cuba’ is associated with each of the other three concepts by unspecified relationships. With our additional knowledge, we can interpret the concept with a specific referent, ‘Cuba,’ to be a member of the classes ‘country’ and ‘Soviet-client’ and further that it has the property of being ‘communist.’ As illustrated later in the text, this associative model of memory provides the basis for modeling both belief systems and problem representations.

An additional part of the associative network model of memory is that activation or search through memory proceeds by spreading activation whereby nodes in memory are
activated (or searched) in a pattern spreading outward across all links from any previously activated nodes. Spreading activation will explore all relationships from a concept and evaluate each subordinate concept, exploring all relationships from all the concepts one relationship away from the starting point before proceeding to all the concepts two relationships away from the starting point and so on. Spreading activation is potentially exhaustive and uses no knowledge about the ‘meaning’ of the concepts or relationships to direct activation (search) across the network.

Trace models of memory are similar to associative networks in that they also have a concept and relationship structure. However, in the trace model, the unit of memory is a pathway across a set of nodes, where the pathways are not necessarily connected to each other. For example, in a trace memory system, your last experience of going out to eat at a restaurant, from beginning to end, could be stored as a single item, separate and distinct from other occasions. Each experience results in a trace in memory which may not be directly connected to other similar experiences. Memory search in trace models is hypothesized to be based on similarity between items in the stimulus and concepts in stored memory traces. When a threshold of similarity is surpassed, the entire trace then becomes activated in memory. In the political realm this is one way in which “past experience conditions present response.” For example, in a sequence of negotiation episodes, such as the SALT talks, negotiators’ memories of how the talks unfolded in one round may influence their expectations for the sequence of events in the next round and therefore the strategies they will use to reach their goals.

One of the intriguing points that Estes makes is that these two architectures are homologous and each can be represented in terms of the other. Neither associative memory models or trace models specify their architectures in a general enough manner to extend them beyond the typical recognition and trait experiments of Psychology. Parallel to the
distinction between associative and trace models of memory is a distinction between semantic and episodic memory (Tulving 1972; Fiske and Taylor 1984). Semantic memory is analogous to associative memory where individual pieces of information are stored separately, but in this case the information in semantic memory refers only to the meaning of concepts or ideas and to facts. Episodic memory on the other hand contains information about specific experiences and may be structured in a manner more similar to trace models of memory, in that it is thought to contain sequenced information that forms a single episodic memory and is retrieved as a unit.

At a slightly less general level the idea that beliefs are packaged in coherent structures of conceptually related items is widely accepted (Fiske and Taylor 1984; Markus and Zajonc 1985; Cowan 1986; Dutton and Jackson 1987; Firebaugh 1988). These coherent structures are collected under the rubric of schema, scripts (sequences of actions and events), or frames (models of contexts). These models of memory are not as well developed as either associative network or trace memory models, and can be accommodated by them if we consider individual concepts and relationships to be the building blocks of larger structures. Thus, coherent structures such as schema can be said to emerge from the primary structure of the individual concepts and relationships, just as the macro structure of proteins and DNA is, respectively, a property of the underlying sequence of amino acids and nucleotides.

The distinguishing feature of schema models is that they introduce hierarchy into an otherwise flat system, in that schemata can contain or point to other schemata. Schema models also provide, through hierarchical structure, a mechanism to store related concepts under a more abstract or higher level concept, such as a generalized chair schema that allows for the recognition of chairs even though particular instances of chair vary widely in physical form. Although schemata are thought to be associated with a wide range of
concepts, including social and political stereotypes, the structural features of schemata are not well defined or specified in much detail other than an assumption of hierarchy.

Frames are fairly simple data structures that can be thought of as records, like personnel records that have spaces or slots for expected pieces of information like name and Social Security Number. Scripts can be thought of as frames with time and action dimensions, i.e., a script is a data structures with spaces for time order dependent events. In both frames and scripts the information that can be put into a given slot may be limited to certain types such as number or location information, and others may always have the same value, called a default value. Much of the deductive power of frames and scripts comes from the fact that many of the slots are given default values which are assumed to be true unless otherwise indicated. Default values provide a mechanism of inferring information about objects and events sequences, and are based on the premise that inference processes are based on expectations generated from prototypes of objects and event sequences. One of the most familiar scripts is associated with going to a restaurant and ordering a meal (Figure 3). Like schema, frames and scripts can also be considered to be complex nodes in a propositional network that can include not just relations but other information and even conditional computations to be performed when needed.
**EAT_AT_RESTAURANT SCRIPT**

The lists in parenthesis indicate the range of allowable values for that slot.

Props: (Restaurant, Money, Food, Menu, Tables, Chairs)
Roles: (Hungry_persons, Wait_persons, Chef_persons)
Point_of_View: Hungry_person
Time_of_occurrence: (Times_of_operation_of_restaurant_establishments)
Place_of_occurrence: (Location_of_restaurant)

**Event_sequence:**

First: Enter_restaurant script
Then: IF[ wait_to_be_seated_sign OR reservations] THEN [get_maitre_d’s_attention script]
      Then: Please_be_seated script
      Then: Order_food script
      Then: Eat_food script UNLESS [long_wait] WHEN [ exit_restaurant_angry script]
      Then: Pay_for_meal script
      Finally: Leave_restaurant script

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In summary, the features of a of cognitive architecture adopted here are: that memory is associative, i.e., it has a concept and relationship structure; the relationships between concepts are directional and of several types; and memory structures may be hierarchical (a possibility that is consistent with directional relationships between items in memory). This characterization of cognitive architecture leads to a ‘shoe box’ model of a belief system, in which the connectedness of individual concepts varies. The belief system is therefore clumpy, with structures of different complexity that may or may not be connected to other structures (Figure 4). For example, your beliefs about chocolate sundaes

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\(^{10}\) It is interesting to note that this model is also coming into use for the study of attitudes and attitude change, an area of research that has previously focused on numerical weighting models (see Tesser & Shaffer 1990).
may have no connections to your beliefs about politicians. Combining this model with the
definition of a problem representation from the earlier discussion, we can assert that a
problem representation will be some subset of the concepts and relationships in memory,
i.e., beliefs in the belief system, that are associated with one or more perceived features of
the stimulus (the problem). The problem representation, constructed by an individual from
items in the individual’s belief system, may include one or more of the unconnected
structures in the belief system, and may include concepts that are one or more relationships
away from the activated concept(s), i.e., those concepts directly associated with some
feature of the stimulus.\footnote{This characterization of a problem representation in terms of a subset of nodes and links
from a belief system is very similar to the description of an “explanation” used by
Bonham and Shapiro (1979) in their work on Axelrod (1976) cognitive maps. While this similarity may be an artifact of the data structures employed by Bonham
and Shapiro and myself, it is encouraging that other evidence for this
characterization can be found in the Psychology literature on memory activation and
priming (see for example Fiske & Taylor 1984:175, 231-234).} It is also reasonable to assume, as the “editing” process of
problem representation occurs, that the problem representation may grow larger or smaller,
and that the problem representation may be reviewed and modified during problem solving.
To reiterate, both belief systems and problem representations can be characterized as
directional concept and relationship structures which will vary in structure and content.
Figure 4. The ‘shoe box’ model of a belief system.

Cognitive structures of various size and connectedness populate the long term memory of the subject and constitute the subject’s belief system.

How Do Problem Representations Change?

Given my interest in change in Carter’s problem representation and policy it is relevant to investigate how problem representation change. There are two different aspects of change in problem representations which are expected to correspond to change in policy behavior; changes within a problem representation which are expected to correspond to small refinements or incremental change in policy, and the complete transformation of a
problem representation which, due to the great extent of change, is expected to result in sharp changes in policy.

*Change Within Problem Representations*

Given the theoretical structure of belief systems and problem representations described above, we can turn to the question of where and how changes will occur in problem representations. Several sources suggest that change in problem representations is most likely to occur at the terminal edge, i.e., at concepts which have no relationships leading to other concepts. The Probabilogical model of belief/attitude change (Petty 1991), schema models (Crocker et al. 1984) the Quine-Duhem Thesis (Quine 1953, Losee 1980), and previous work with cognitive maps (Bonham, Shapiro and Trumble 1979; Bonham, Heradstviet, Narvessen, and Shapiro, 1978) point to this conclusion.

The Probabilogical model of belief/attitude change (Petty 1991) and some schema models (Crocker et al. 1984), conceptualize the belief system as a planar network of propositions with vertical and horizontal depth. In this structure, propositions are related to each other as arguments and conclusions (vertical) or as supports for the same conclusion (horizontal), in a manner reminiscent of syllogisms or resolution theorem proving. This model is consistent with the associative network model, given the directional nature of the links in the associative network model, with ‘from’ nodes located at the ‘top’ of the planar network, and ‘to’ nodes located at the ‘bottom.’ Belief change in this model is a direct function of the addition of new propositions to the network and how well integrated any related propositions are in the belief structure. Beliefs that are not well integrated into the belief structure, i.e. they are at the edge of the network, can be quickly and easily affected by the addition of new propositions, while change in well integrated beliefs is a function of their vertical and horizontal depth in the structure and the relative depth of the new propositions. The further up (or down) in the structure that a given belief is from the new
proposition, the longer the change will take to propagate to that belief. The greater the horizontal structure of a given belief, i.e., the number of other beliefs that support the belief in question, the smaller the expected magnitude of change in the belief. ‘Top’ level beliefs are the least likely to change in this model due to the large number of propositions that will be affected lower in the network by changes at the top.

Bonham et al. (1978; 1979) also suggest that individuals will change their peripheral beliefs rather than central beliefs, and they base this assertion on a cognitive miser model of the human decision maker. The cognitive miser model suggests that decision makers will minimize changes to the belief system in order to conserve cognitive resources, and changes at the periphery of the belief system would require less subsequent changes than highly connected beliefs, and therefore less cognitive work. The modification of central beliefs might produce a cascade of changes in the belief system that would not occur if peripheral beliefs are modified. Both the Probabilological model and Bonham et al.’s cognitive miser are consistent with the Quine-Duhem Thesis (Quine 1953, Losee 1980) on change in systems of knowledge, which suggests that the truth value of central propositions in a system of knowledge can be maintained, even in the face of discrepant information, with changes to the periphery of the system of knowledge. Furthermore, Quine suggests that central propositions are more valued and therefore less likely to change than less valued peripheral propositions, this ‘value’ proposition corresponds to the use of salience, or strength of association of concepts, in the belief system and suggests that less salient relationships and concepts will be more likely to change than highly salient relationships and concepts.

In addition to this broad conceptualization of change in belief systems, two additional models for change within cognitive structures can be found in the schema literature; the bookkeeping, and sub typing models (Rothberg 1981; Hamilton and Troiler
In the bookkeeping model, as incongruent information is encountered, the schema is adjusted incrementally based on the frequency of values for each feature type in the schema (the feature type ‘state’ for example could have ‘democratic,’ authoritarian,’ or ‘monarchical’ as its value). In the sub typing model, when incongruent information exceeds a given proportion of information in the current schema (a package of information in the belief system), then a new schema is formed based on the incongruent instance. Hamilton and Troiler (1986) give an example of the sub typing model based in racial stereotypes and a process they term schema differentiation. In this process when an incongruent example of a schema is encountered a new schema is created for the incongruent example subordinate to the original schema. For example, if a conservative American encounters a committed communist who is in favor of capitalist economics, he may have to create a new schema called pragmatic-communist, subordinate to communist, to comprehend the meeting and thereby engage in differentiation. This process of differentiation forms the basis of conflict resolution workshops conducted by Herbert Kelman and his associates (Kelman 1979, 1982; Kelman and Cohen 1979). The object of these pre-negotiation workshops is to allow opponents in protracted conflicts “to learn to distinguish between the elements on the other side that are opposed to negotiation [...] and those which at least under the proper circumstances are available for it” (Kelman 1987:359).

In a broader discussion of schema (cognitive structures), Crocker et al. (1984; see also: Bonham, et al. 1979; Bonham et al 1978; Chaiken and Stangor 1987) indicate that mediating variables for schema change include the characteristics of the information perceived, i.e., it must be moderately discrepant, unambiguous, and memorable. Various other researchers have suggested additional characteristics of information as mediating variables for change in either schema, attitudes, or beliefs: personal relevance (Chaiken and
Stangor 1987), exposure (Chaiken and Stangor 1987), organization of information, i.e., dispersed versus concentrated (Crocker et al 1984), concrete versus abstract (Anderson 1983), and placement relative to the midpoint of an appropriate evaluative dimension (Fishbein and Lange 1990). Additionally, these researchers have suggested that characteristics of the individual and his/her belief system such as, core beliefs/ values/ centrality of beliefs (Rokeach 1968; Bonham et al 1978), prior knowledge (Chaiken and Stangor 1987), need for cognition (Chaiken and Stangor 1987), processing load (Crocker et al. 1984), schema structure (Crocker et al. 1984), schema accessibility (Crocker et al. 1984) public self-consciousness (Walsh and Charalamides 1990), commitment/motivation (Crocker et al. 1984; Millar and Tesser 1986; Kunda 1990), or the logical and practical disconfirmability of the knowledge structure (Crocker et al. 1984), also serve as mediators of change. And although the issues surrounding these mediating variables for belief change are important and in need of further research, they are not covered directly in the current research.  

One problem with the schema change models for this study is in neither of the two models discussed, is the information structured in a particular way, an issue which is a subject of debate in Psychology. Furthermore, although the sub typing and conversion models can be combined into a single model, schema theory’s lack of a data structure limits it to very broad statements that are not very useful for simulation exercises or further theory development. Overall, from the discussion of belief systems and schema, change within belief systems and problem representations is expected to occur at the periphery or bottom edge, and in those concepts and relationships which are least salient to the problem solver.
Change Of Problem Representations: Re-Representation

Previously, change in problem representation has been discussed in terms of discrete changes within a problem representation which might occur during the process of problem solving, however, problems can also be re-represented completely during problem solving, i.e., a new representation can be created. A possible mechanism for re-representation is suggested by Kaplan and Simon (1990) in a paper on insight in problem solving. Kaplan and Simon suggest that the mechanism behind insight, or a change in problem representation, is a search for a new problem representation (used synonymously with problem space) triggered by frustration at a lack of progress in problem solving with the current problem representation, and the presence of, and attention to, cues that can guide the search for a new problem representation. In the Kaplan and Simon model a change of problem representation occurs when new premises or givens for the problem are found, which would correspond to a change in the 'top' level concepts in the model of problem representation, which might entail inclusion of information from disjointed parts of the belief system or changes in relational linkages which then propagate throughout the problem representation. This model is similar to a third model from the schema literature, the conversion model of schema change (Hamilton and Troiler 1986; Fiske and Taylor 1984; Crocker et al. 1984). In the conversion model when incongruent information is encountered which exceeds a given proportion of the total information contained in the schema, the schema converts to reflect the information in the incongruent instance. The frustration/conversion model of change of problem representation is the working hypothesis for large scale changes that may be found in the problem representation of President Carter which might be expected following the Soviet entry into Afghanistan. Changes in top level concepts, and numerous changes in individual relationships between concepts would provide support for this explanation.
Research Strategy

The research strategy for studying the process(es) that connect beliefs and behavior which flows from this theoretical discussion has two components: (1) the operationalization of problem representation and the definition of measures, and (2) the application of the operationalization and measures to the foreign policy speeches of President Jimmy Carter. Measures of the characteristics of problem representations are needed as indices of change that provide evidence of the processes of change that occur over time. Thus the operationalization will allow the identification and tracking of changes in beliefs as expressed in the speeches.

Once changes in the problem representation can be tracked, a method can be developed for generating problem representations and the corresponding policy choices for each of the belief system models constructed. The generation of problem representations and the deduction of policy choices from a model of belief systems will produce data which can be compared to the actual policy behavior of President Carter. This comparison of deduced and actual policy choices will provide an assessment of the model of problem representation construction and the model of policy reasoning. The chapters which follow carry out this strategy beginning with the operationalization of concepts and the construction of measures, followed by their application to the foreign policy speeches of President Carter and an analysis of results.
CHAPTER III

OPERATIONALIZING PROBLEM REPRESENTATION

Given the theoretical structure of problem representations detailed in Chapter I, there are four tasks that must be accomplished to operationalize the theory: (1) the identification of beliefs (2) their representation in a formal structure (3) the development of measures for change in problem representations that correspond to changes in policy behavior, and (4) the development of a process model for the generation of problem representations. The completion of these four tasks will allow the investigation of the conditions and processes that allow for, or prohibit, representational shifts.

Identifying Beliefs

The goal of this research is to investigate the problem representation process that connects the prior beliefs and the policy behavior of an individual. This requires an assessment of the internal cognitive representations of individual policy makers. Such a task immediately presents issues of evidence and inference that are obstacles to research. The greatest obstacle to research in this area is that there is no known method of assessing the cognitive state, the mind, of an individual directly, even if the individual of interest is available for direct study. In addition, the data available for the indirect measure of the cognitive representations of individuals is often limited to public pronouncements and behaviors. While it is true that other private deliberations may become available at some interval after public officials leave office, the researcher interested in the future policy behavior of current policy makers, such as the author, must rely on publicly available texts.
and behaviors. The dilemma for the researcher using this data, and in a particular textual data, is that these data may be the result of the conscious management of public utterances crafted for instrumental reasons and they may also be the result of collaborative authorship. The selection of President Jimmy Carter as the subject of the study serves to mitigate the problems of authorship and public versus private beliefs because the Carter Administration allowed each individual more control and authorship of speeches than other recent administrations, and this serves to minimize authorship questions (Rosati 1987/91:192, Smith 1986: vii, Weintraub 1986). Carter himself discusses instances where he wrote his own speeches suggesting that this was commonplace, in particular the June 7, 1978 naval Academy speech (Carter 1982:229) and the February 20, 1979 Georgia Institute of Technology speech (Carter 1982:237, see also page 238). These speeches are not significantly different from the other speeches (see below) for any measured characteristic (bridges, relationships, subgraphs, maximum salience, and minimum salience) or the measures developed below (size, connectedness, dependency, mean salience, and standard deviation of salience).

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12 Bonham, in private conversation, has suggested that this is the reason why a discourse perspective is better, in terms of the validity of the research design, but it does not address whether or not there are such things as individuals. Only if you are willing to move to conversations as your unit of analysis are you able to make this move. Another way to view this is that the very least individuals are the carriers of discourse, but they do not arrive at the ‘first’ conversation as tabula rasa and record the discourse faithfully. The ‘recording’ and ‘transmission’ of the discourse is mitigated by the prior beliefs, experiences and cognitive mechanisms of the individual. This interpretation of the nature of discourse leads me to an individual unit of analysis.
### Analysis Of Variance For Speeches Known To Be Authored By Carter Versus Others

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Squared Multiple R: 0.007

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Multiple R: 0.212  
Squared Multiple R: 0.045

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Dep Var: Mean Salience  N: 22  Multiple R: 0.279  Squared Multiple R: 0.078

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Dep Var: Standard Deviation of Salience  N: 22  Multiple R: 0.005  Squared Multiple R: 0.000

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Dep Var: Maximum salience  N: 22  Multiple R: 0.171  Squared Multiple R: 0.029

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The latter problem, the management of public beliefs, is one that cannot be eliminated without the cooperation of the subject or the subject’s close confederates, however, for cases where reasoned action is of interest, managed statements of beliefs may provide a better guide to behavior than spur-of-the-moment comments. Rosati (1987/91:190-192) for example, suggests the following three reasons for the use of prepared texts: first, prepared texts often act as a constraint on political leaders due to the expectations created by the communication both domestically and externally, second, due to the need for public
officials to maintain a high degree of credibility, prepared statements are often structured to convey the intents and beliefs of the speaker, and third, decision makers may influence themselves by their own public declarations. However, for predictive research projects which seek to determine the relationship between cognitive representations and policy behavior, the question of the usefulness of prepared texts is best resolved by assessing the accuracy of their predictions; predictions which may well vary from case to case as the level of belief management attempts and the skill of execution vary.

Beyond the public management of beliefs, the context of the text used for data collection may also introduce bias that must be controlled. For example, while press conference responses are a good source of relatively spontaneous statements, the apparent outstanding salience of any particular item, may well be due to reporters’ interests rather than the President’s. This highlights a potential difficulty of using press conference interchanges for data i.e., the salience of some more peripheral items may be a consequence of a pushy reporter or influential audience members rather than true prominence in the subject’s belief system. Therefore, the data that appear most appropriate for the indirect measurement of cognitive representations consists of prepared speeches and introductory remarks prior to question and answer sessions at press conferences. The primary source of this material for President Carter is the Weekly Compilation of Presidential Documents (1977-1980), published by the Office of the Federal Register, National Archives and Records Service, of the General Services Administration. In all, twenty-two of President Carter’s foreign policy speeches have been coded, covering the years 1977 to 1980, and including the sixteen Carter speeches in Rosati’s study (1987). These speeches cover the period from January 20, 1977 to August 21, 1980 and include all of Carter’s speeches on general foreign policy topics, defense, national security, and the Soviet Union. Speeches speeches that address only SALT are excluded. The coverage of these speeches is fairly
consistent except for a period from March 1979 to the end of the year where there are very few available speeches. Of the speeches that Carter made during this time, most focus on the need for a national energy policy. These speeches do reflect Carter's concern about dependence on foreign oil, but otherwise address domestic needs and policy. Given the range of topics and audiences for the speeches analyzed they are as representative of Carter's foreign policy beliefs as any expressed in prepared statements.

The procedure used for identifying policy beliefs within these source texts is a human coded content analysis system, designed to produce data items that can be incorporated into the data structure discussed in below. The initial unit of analysis for content analysis is the sentence. However, because texts are often arranged as a coherent whole, and may be self referring, the sentence is taken in context of either identifiable and distinct paragraphs or the entire source text. This allows for the replacement of pronouns and provides the coder with an opportunity to clarify ambiguous references. Therefore the unit of analysis is expanded beyond the sentence as needed to capture the relationships expressed in the text. For example, paragraphs are often arranged with a thesis sentence and several supporting examples, to capture the supporting role of the examples, it is necessary to look at the paragraph as a whole rather than restrict coding to a single sentence.

In broad terms, the content analysis system seeks to identify beliefs that take the familiar subject relationship object format often found in English and used in creating

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In the content analysis system human coders translate the free text into data statements which are then compiled into cognitive maps by the automated portion of the system. As such it might be described as human coded with machine assisted analysis. This is in contrast to other forms of content analysis such as the Kansas Events Data System (KEDS) (Schrodt 1991) which has the potential to be fully machine coded with machine assisted analysis, or systems which are both human coded and human analyzed.
causal cognitive maps (Axelrod 1976), for example the ‘Cuba is-a communist-country’ statement described earlier. The types of relationships and concepts that make up the content analysis coding system were derived from both Cognitive Psychology and the study of Foreign Policy, and while the resulting coding system has parallels with Axelrod’s (1976) coding system for causal beliefs, it allows for different types of relationships between concepts, beyond causal relationships, and captures much more information from the text, including goals and logical relationships between concepts.

The sources for the relationships used for identifying beliefs include Jean Piaget’s theory of cognitive development based on the empirical observation of children (Piaget 1982; Mayer 1992; Daehler 1985), advances in cognitive development that build on the legacy of Piaget (Keil 1989, Carey 1985), and previous work in events coding in International Relations including the Kansas Events Data System (KEDS) (Schrodt 1991). According to the observations of Piaget (Piaget 1982; Hothersall 1985) children acquire the ability to recognize and use different relationships between concepts as they develop, including: causal, goal, instrumental, and property (attribute) relationships between birth and two years of age, classification, temporal, and spatial relationships between seven and eleven years of age, and hypothetico-deductive and idealized relationships in adolescence. The initial types of relationships were used in conjunction with exploratory readings of foreign policy texts to produce the coding relationships as discussed below. An example below, taken from President Carter’s inauguration speech, illustrates the generation of data statements from free text.
Coding Relationships

There are many different relationships available to the coder (see below), each of the relationships is considered to be independent, although some appear only in combination with others. Items coded using the policy relationship for example are not required to be consistent with items coded using the goal relationship, however, the strategy relationship does connect goal statements with means statements. The coding relationships can be broadly divided into two types, relationships between concepts and actions of agents. The relationships between concepts refer more particularly to the description of problem representations, while the actions are induced from foreign policy texts and the KEDS event categories. However, the use of these relationships is not restricted to actors. The relationships discussed here are all relationships between concepts, a full discussion of all the relationships can be found in Appendix A: WorldView Content Analysis Instructions.

Causal Relationships

Causal reasoning is prevalent in human reasoning and, as observed by Piaget (1982:118-153), arises early in a child’s life along with goals and instrumental reasoning, although all are predominantly egocentric in nature during early development. However, prior to Piaget’s observations, causal reasoning had long been a subject of interest for the investigation into human nature. Causal reasoning and the search for causal connections between events in the perceived world has been of concern at least since the scientific investigations of the ancient Greek philosophers Plato and Aristotle, and recurs repeatedly in texts on the nature of man such as Hume’s A Treatise of Human Nature (1740/1985). Causal reasoning has been of great interest in this century to the field of Psychology, where causal reasoning is assumed to assist people in constructing a coherent interpretation of the
world (Piaget 1982:198-241; Tversky & Kahneman, 1980). The prevalence of causal reasoning has been demonstrated by Michotte (1963), highlighted by Heider (1958), and given rise to an area of study that focuses on causal attribution (Jones, Kanouse, Kelley, Nisbett, Valins & Weiner 1972 cited by Tversky & Kahneman 1980). Spontaneous causal reasoning has also been observed in subjects confronted with novel data (Anderson 1983). The *cause* relationship is provided for the discrete actions of agents, for example:

*At the recent summit, we set in motion an international effort....*

*united-states cause international-effort-...*

However, within the overall concept of cause, we can distinguish negative and positive causes; causes which produce an increase in quantity, frequency or likelihood in some effect, and those that produce a decrease. For this reason two additional categories are provided for the coding of causal relations: +, to code causal relations which are designations of positive causal relationships between concepts, and - to code negative causal relationships. Examples:

*But any of these incidents-all of them add up to clear violations of international law. And I think they do raise tensions; they clearly do.*

*clear-violations-of-international-law + tensions*

*This comment out of Iraq attributed to Saddam Hussein, the President. ... And I don't think it helps peace in the Middle East.*

*comment-out-of-iraq-attributed-to-saddam-hussein - peace-in-the-Middle-East*

**Logical Relationships**

The logical relationships used in identifying beliefs in the WorldView system include three comparison relationships: less then (<), greater then (>), equal to (=), and two deductive relationships *condition* and *if-then*. Both of these latter coding categories, *condition* and *if-then*, are used to model conditional, or hypothetico-deductive reasoning
(Piaget 1982:394-398,434-44, & 461-477; Hothersall 1985; Mayer 1992). The condition relationship represents the context under which the subject concept is true or applicable. The object concept in a condition data statement can be a single concept or a subordinate data statement that must currently be true for the condition to be satisfied. For example:

While our ultimate goal is for all nuclear powers to end testing, we do regard this as a prerequisite for the suspension of tests by the principal nuclear powers.

(condition)

(principal-nuclear-powers stop nuclear-testing)

An if-then relationship indicates that the object will become true (or can be performed) if the subject is be true. If-then relationships have a complete subordinate data statement as both object and subject. The if-then coding is also designed to capture the expression of standard operating procedures (Allison 1969; Halperin 1974), or policies which are in place. These policies may take the form of if then statements, or strategies that have been publicly pronounced or codified internally in the policy making apparatus. For example:

If the soviet union ratifies SALT II, then we will also ratify it.

(if-then)

(soviet-union ratify salt-ii)

(United-states ratify salt-ii)

The if-then relationship captures sufficient conditions, while the condition relationship captures necessary conditions, a combination of the two handles necessary and sufficient conditions.

Attributes

This group of coding relationships is used for the attributes of things in general and broadly corresponds to Piaget’s observations on children’s construction of reality(1982:250-294). The attribute coding category is provided to record the
characteristics of represented concepts such as the color, throw weight, or tonnage of an item. For example:

I would simply say the status quo is unacceptable

status-quo attribute acceptable

The attribute relationship provides a mechanism for classification based on matching class attributes, and the integration of new situations and actors into the modeled belief system based on their attributes. In addition to the attribute coding relationship, three additional relationships are provided for coding attributes that are used frequently in foreign policy texts, and have implications for behavior: possess, know, and part-of.

The possess coding category is used to indicate control over and physical possession of resources, for example material assets, including those that may be considered to be military capabilities. Possess is distinguished from the attribute relationship in that it indicates ownership of objects, rather than innate qualities of objects. The know coding category, is used to represent beliefs about other actors’ beliefs. For example:

The leaders of Latin America understand that isolation hinders economic growth.

leaders-of-latin-America know (isolation - economic-growth)

At present this can only be used for statements with which the author of the speech agrees. In future versions of WorldView, this functionality may be replaced by allowing an additional type of node(schema or case) which contains its own cognitive map. This schema-type of node would allow representation of other actors and their beliefs in the author’s belief system and the storage of cases that could be used for case based reasoning and increase the flexibility of the system. Lastly the part-of relationship indicates that the subject is a component or integral part of the object. In cases where a concept is said to be
comprised of several other concepts, then each component becomes the subject of a separate part-of relationship. For example:

First, we have reaffirmed America's commitment to human rights as a fundamental tenet of our foreign policy.

human-rights part-of united-states-foreign-policy

Classification

Classification is another process thought to be used by individuals to provide a coherent interpretation of the perceived world and answers the question "what kind of thing is this?" The ability to classify appears in some sense to be innate to human beings and develops in most children between the ages of seven and eleven (Piaget 1982:359-394). Classification also plays an important role in studies of problem recognition and problem solving (Jackson & Dutton 1988; Dutton & Jackson 1987; Kotovsky et al. 1985; Kaplan & Simon 1990; Dutton et al. 1983; Lambert & Newsome 1989; Cowan 1986; Moreland & Levine 1992) and in artificial intelligence (Clancey 1984; Chandrasekaran & Punch 1988; Chandrasekaran 1986; Jackson 1990; Firebaugh 1988), where one of the techniques used to impart "intelligence" to software systems is to provide classification hierarchies for use in reasoning. Classification in the form of the is-a coding category captures classifications made by policy actors. The is-a coding category provides a mechanism for inheritance between concepts, for example when the concept "Cuba" is encountered, and the relationships: "Cuba is-a communist-country" and "communist-country is-a enemy-of-USA" are present in the represented belief system, then, by inheritance, we can quickly make the inference "Cuba is-a enemy-of-USA". (Figure 5)
Figure 5. A cold war example of a semantic net and inheritance.

We know directly that Cuba is a communist country, and by the inheritance of the properties of communist-country we also know that Cuba is an enemy of the USA.

Location

Given that foreign policy problems, by most definitions involve some location other than a domestic location, and that people develop spatial reasoning ability innately (Piaget 1982:576-642), the location coding category is provided to indicate the location of concepts, for example the location of missiles in Europe, or ships upon the high seas. For example:

*USS Hood, currently in Manila*

uss-hood location manila

Location becomes important in foreign policy reasoning in conjunction with the attribute and other coding categories. For example, Sylvan and Thorson (1992), in their reassessment of previous work on the Cuban Missile Crisis (Thorson and Sylvan 1982), suggest that the location of short range missiles can change their classification from
defensive to offensive, i.e., short range missiles that can reach domestic targets are offensive.

**Strategy**

The *strategy* coding relationship corresponds to statements that indicate a means to achieve a goal. This category is indicative of an assumption in the model of rationality in human action, to the extent that humans are considered to act in order to achieve goals. The concept of a *strategy* coding category also corresponds to Piaget's empirical observations of instrumental reasoning in children (1982: 215-249), and to the operator concept in a state space description of a problem from the information processing perspective (Newell & Simon 1972; Mayet 1992). As such, a *strategy* relationship indicates that the subject of the data statement, a goal, has associated with it an object that is performable or achievable, and which is a cause of the subject. For example:

*To slow the costly buildup of conventional arms, we are seeking global policies of restraint.*

(United-states reduce costly-buildup-of-conventional-arms)
strategy
(global-policies-of-restraint-in-conventional-arms attribute exists)

In effect, this coding category is an additional specialization of the causal relationship, and indicates that this cause/action is the preferred means for reaching the goal.

**Warrant-for**

The last coding relationship discussed here, *warrant-for*, is derived from the structure of the foreign policy texts, where it is often the case, as it is elsewhere, that the relationship of the sentences to one another provides their meaning. As mentioned previously for example, paragraphs are often arranged with a thesis sentence followed by a number of arguments or examples and concluded with a restatement of the thesis as a
transition to the next paragraph. The warrant-for relationship is used to capture the relation of the supporting argument or example to the thesis. The subject of a warrant-for relationship is the example or support and the object is the thesis. For example:

*We have our own shortcomings and faults, and we should strive constantly and with courage to make sure that we are legitimately proud of what we have.*

(United-states attribute shortcomings-and-faults)  
Warrant-for  
(United-states feel legitimately-proud-of-what-we-have)

The number of warrants a proposition has is also used in addition to the frequency of the proposition as a measure of the proposition’s salience for the author.

The content analysis system (WorldView Content Analysis System) is designed to use the set of defined coding relationships to produce data items that can be incorporated into the subject-relationship-object structure of the WorldView model with as little interpretation as possible by the coder. However, it was discovered with the previous incarnation of the content analysis system that more information is often required, especially when actions are coded, which may have indirect objects, or may be future or planned actions rather than present actions. This problem, combined with difficulties in representing the simple subject-relationship-object structure effectively (see next section) led to the inclusion of two other parts in data statements, truth-values and relationship modifiers (see below), which allow the coder to more easily capture information such as tense and true and negative statements. With the inclusion of this information, data statements created by coders are composed of five parts: the subject concept, a relationship between the concepts, a relationship modifier, a truth-value, and a object concept. It is the coders task to transform free text into five data statements ready for processing of the following form:
subject relationship truth-value relationship-modifier object

There are five recognized truth-values and six recognized relationship modifiers.

Truth-values

The negation of relationships occurs with some frequency in foreign policy texts, and it is important that these are captured in the coding system. In order to capture these negations with the greatest semantic fidelity, and for the ease of computation, a truth value is coded for each relationship, and can have a value of either true, false, possible, impossible, or partial. The true truth-value indicates that the statement is true for both subject and object, and if either of these is a class of instances, then the statement is true of all instances of the class(es). The false truth-value indicates that the statement is not true for both subject and object, and if either of these is a class of instances, then the statement is not true of all instances of the class(es). The partial truth-value is a qualified indication of truth, and is used when either the subject or object is a class of instances, but the statement is true of only some of the instances of the class(es). A possible truth-value indicates that the statement could become true at some unspecified time but it is not necessarily expected to become true, including statements of capabilities. An impossible truth-value indicates that the statement cannot become true at any time. True and partial take logical precedent over possible while impossible takes logical precedent over false. If a statement cannot be true it is false, while if it is true it is also possible. For example:

The economies of most Latin American nations have been developing rapidly, although, of course, at different rates.
Some have an impressive rate of growth.

The economies-of-Latin-American-nations attribute partial impressive-rate-of-growth
Relationship Modifiers

The WorldView content analysis system recognizes six relationship modifiers, *past, present, future, +goal, hypothetical* and *normative* which are used to code the circumstances under which the data statement indicated by the relationship and truth-value are true. A *past* relationship modifier indicates that the relationship referred to is in the past, or was true, partially true, or false in the past. If the relationship is an action, then the action is now complete. A *present* relationship modifier indicates that the subject, an actor, is performing some action, the object, that is ongoing, or that the indicated relationship is currently true, partially true, or false. The *future* relationship modifier is used to represent the statements that the actor believes will be true at some future point in time, and may have implications for the actors policy behavior. To the previous example the *present* modifier would be added:

*The economies of most Latin American nations have been developing rapidly, although, of course, at different rates. Some have an impressive rate of growth.*

economies-of-Latin-American-nations attribute partial *present* impressive-rate-of-growth

The *goal* relationship modifier is included in the coding scheme based both on the observations of Piaget, and on an information processing view of policy actors, which has benefited from the work of Herbert A. Simon and his numerous colleagues and collaborators (Newell & Simon 1972, 1976; Simon 1980, 1985, 1990). The information processing perspective assumes that policy actors are goal driven, and are at some level aware of their goals, although they may not be aware of the conflicts between goals until present with a conflict situation. Goal relationships coded from textual data provide the motivation for the policy behavior of the belief system model, which in a very literal sense
is goal driven. A +goal relationship modifier indicates that the statement indicated by the relationship and the truth-value is a statement that the author of the text wants to become true. For example:

*We desire a freeze on further modernization and production of weapons.*

united-states stop true +goal modernization-and-production-of-weapons

The +goal relationship modifier, combined with the strategy relationship, provides a means for capturing goal hierarchies present in the text, as the relationships with +goal modifiers can be both the subject and object of strategy relationships.

The hypothetical relationship modifier is used with the condition and if-then relationships to capture hypothetico-deductive reasoning (Piaget 1982:394-398,434-44, & 461-477; Hothersall 1985; Mayer 1992) where if a statement were to become true in the present then another statement would be true or to express conditions for the first statement to become true. For example:

*If these threats to our deterrent can be controlled, and I believe they can, then we are prepared to limit our own strategic programs.*

(United-states limit true hypothetical united-states-strategic-programs)
condition true present
(threat-to-united-states-deterrent-represented-by-the-build-up-of-strategic-soviet-offensive-weapons attribute true hypothetical controlled)

The normative relationship modifier indicates that the relationship is normatively valued by the author of the text, or if there is a sense of responsibility or obligation. The normative relationship modifier is included because of my own observation from political texts that policy actors will often state normative preferences about the state of the world, but that these statements are often made in an ideal sense and the author demonstrates that s/he distinguishes between goals, which are to be acted on and striven for, and preferences, which would be “nice” if they happened. External support for this category comes from
studies in Developmental Psychology (Piaget 1982; Mayer 1992; Hothersall 1985), which record the acquisition of an idealized reasoning ability during adolescence. For example:

The Soviet Union should accept the new responsibilities imposed by the changing nature of international relations.

soviet-union accept true normative new-responsibilities-imposed-by-the-changing-nature-of-international-relations

Conjunctions

In addition to previously discussed coding items, the WorldView system also recognizes two conjunctions, and and or, which are used with specific types of compound concepts. The and conjunction is used when two or more actors are engaged in joint action that cannot be restated as a set of single actions. The or conjunction is used primarily to indicate a set of alternatives to a decision. For example:

But it's also true that the United States and the Soviet Union share many important overlapping interests.

(and united-states soviet-union) share true present overlapping-and-important-interests

In choosing the coding relationships and modifiers described, care has been taken to preserve aspects of texts necessary to simulate foreign policy reasoning (such as goals and strategies) and as observed in the foreign policy texts used for development,\(^{14}\) while keeping the coding system as general as possible. And although the coding relationships were chosen with foreign policy analysis in mind, the structure of the model itself is general enough to work with any set of defined relationships. Each of the relationships is considered to be independent and imposes no contingent relationships on the others.

\(^{14}\)For the initial development of the coding system, texts from the Bush administration were used to avoid fitting the coding scheme to texts from the Carter administration.
However, the strategy relationship does connect goal concepts with means concepts. All of these relationships conform to the same data statement format. In addition to this manual coding, each time the program that compiles the individual data statements into a belief system model encounters a previously processed data statement, a counter for that data statement is incremented. This counter, referred to as the salience of the data statement provides an indicator of the frequency of the data statement in the source material and is used to provide a strength of association for the concepts in the completed problem representation model.

As is true for all human coded content analysis, in this system the coder acts as the observer and interpreter of the text, brings to the text her/his own representation of the international system and understandings of the world in general. Some degree of control over the impact of the natural interpretive role of the coder is attempted by generating coding rules that are specific enough to be understood commonly by coders, analysts, and the general readership, and which produce a high degree of reproducibility between coders. Although the vast majority of the data collection content analysis has been performed by the author, the success of the coding system on these two points has been assessed by using two trained graduate student coders for inter-coder reliability on randomly selected passages. After approximately 12 hours of training the two coders achieved reliability scores of .41 and .43 (using the authors coding as the standard following Krippendorff’s methods (1980)). Analysis of these results indicated a difficulty in coding across sentences which caused cumulative errors. After review of this issue the coders achieved reliability scores of .72 and .83.
Example of Content Analysis Applied to President Carter's Inaugural Address.

*Our Nation can be strong abroad only if it is strong at home.*
And we know that the best way to enhance freedom in other lands is to demonstrate here that our democratic system is worthy of emulation.

(United-states attribute true hypothetical strong-abroad)
(condition true present)
(United-states attribute true hypothetical strong-at-home)

(Other-lands attribute true +goal free)
(strategy true present)
(People-of-the-united-states demonstrate true present (United-states-democratic-system attribute true present worthy-of-emulation))

*To be true to ourselves, we must be true to others.*
We will not behave in foreign places so as to violate our rules and standards here at home, for we know that the trust which our Nation earns is essential to our strength.

(United-states attribute true hypothetical true-to-ourselves)
(condition true present)
(United-states attribute true hypothetical true-to-others)

(The-trust-which-our-nation-earns + true present united-states-strength)
(Warrant-for true present)
(People-of-the-united-states violate false future united-states-rules-and-standards)

The data statements generated from the excerpt of Carter's address, reflect the compound nature of many of the statements in free text. In the first coded statement for example, both the subject and object of the condition relationship are complete data statements (United-states attribute true hypothetical strong-abroad) and (United-states attribute true hypothetical strong-at-home) respectively.

*Our Nation can be strong abroad only if it is strong at home.*

(United-states attribute true hypothetical strong-abroad)
(condition true present)
(United-states attribute true hypothetical strong-at-home)

This statement also demonstrates condition statements where the subject (United-states attribute true hypothetical strong-abroad) is only true if the object (United-states attribute
true hypothetical strong-at-home) is also true, i.e., the modifier becomes present. The excerpt also illustrates promises that are coded as present/future actions;

We will not behave in foreign places so as to violate our rules and standards here at home

people-of-the-united-states violate false future united-states-rules-and-standards

The generation of coded data statements is useful as a way of formalizing the data into a format which can be used as the basis of a formal representation of beliefs which allows for the measurement and manipulation of the problem representation.

**Representing Beliefs**

The platform used for representing beliefs and creating problem representation models is a computational model of belief systems (WorldView) implemented in Macintosh Common Lisp on a Macintosh computer. The use of a computational model is considered appropriate for this study because it provides distinct advantages over more mathematical treatments of beliefs systems (Hastie 1988) or cognitive maps (Maoz & Shayer 1987). Computational models have all the advantages of numeric simulations identified by Hastie (1988) i.e., a clear public statement of the theory involved, expressive versatility, an increased deductive power over other techniques, a common medium for representation in the social sciences, and a readily testable form of theory, with the added flexibility of symbolic and numeric processing, and increased ease of counterfactual modeling (Tamashiro 1989; Schrodt 1988; Hudson 1992b; Mefford 1992). In addition, computational models reflect the goals of the cognitively oriented research program in Foreign Policy Decision Making, for as Howard Tamashiro (1989) suggests, "because mental processes might be postulated to be computational, computational methods can be represented as strong simulations. In this mode they seek to elucidate cognitive structure, processing, and outcomes in contrast to weak simulations such as probabilistic or
regression models that seek to exhibit only accurate outcomes." This position follows from
the Physical Symbol System Hypothesis which can be characterized as a law of qualitative
structure that makes a general statement about the essence of intelligent action. The Physical
Symbol System Hypothesis can be stated as follows:

A physical symbol system has the necessary and sufficient means for
general intelligent action.

Newell and Simon 1976:116

In particular this hypothesis defines a physical symbol system as

a set of entities, called symbols, which are physical patterns that can occur
as components of another type of entity called an expression (or symbol
structure). Thus a symbol structure is composed of a number of instances
(or tokens) of symbols related in some physical way (such as one token
being next to another). At any instant of time the system will contain a
collection of these symbol structures. Besides these structures, the system
also contains a collection of processes that operate on expressions to
produce other expressions: processes of creation, modification,
reproduction, and destruction. A physical symbol system is a machine that
produces through time an evolving collection of symbol structures. Such a
system exists in a world of objects wider than just these symbolic
expressions themselves.

Newell and Simon 1976:117

It is no accident that general purpose computers and in particular, computers running
symbolic manipulation languages are members of this class of systems. Accepting this
hypothesis provides part of the justification for accepting computational models as a
medium for theory development in the Social Sciences and especially suited for research
that seeks to specify cognitive processes such as those that connect beliefs and behavior.

Within Political Science, computational models have been employed in various
studies, which broadly fall into three categories: models of individuals belief and decision
making, models of group beliefs and/or decision making, and models of particular
processes, whether social or cognitive. Models of individual beliefs and decision making
include The Goldwater Machine (Abelson and Carroll 1965), CYRUS (Kolodner 1980),
and POLITICS (Carbonell 1978), all variations on an original model of a 'cold-warrior'
based on a model of a right-wing ideology. ca. 1945-1990. The models of individuals category also includes: JFK/CUBA (Thorson & Sylvan 1982) a rule based model of the decision making of President Kennedy during the Cuban Missile Crisis, CARTER (Lane 1986) a model of President Carter’s belief structures and their change over the course of the administration, a weighted cognitive map model of President Kennedy’s belief structure during the Cuban Missile Crisis (Sergeev et al. 1990), National Command Level (Davis 1987) a model of individual ‘Ivans’ and ‘Sams’ who represent decision makers at the executive command level in the U.S. and the S.U., and a rule based model of three types of congressmen and their decision processes on energy policy legislation (Sylvan 1987). JFK/CUBA is a rule based system and includes in its knowledge structure estimates of the state of the world given any combination of options taken by the United States and the Soviets in the Cuban Missile Crisis. JFK/CUBA was built using simple frames with approximately six defined slots which include United States actions, Soviet Responses, the time to enact the response and the estimated time left until the Soviet Missiles in Cuba are operational. Likewise, POLITICS, Goldwater, and CYRUS, which are based on the Conceptual Dependency model of Schank and Abelson, use frames which include ideologically based assessments of the preferred actions and possible counter actions of the Soviets in response to United States Actions. The models based on the cognitive mapping ideas of Robert Axelrod, use triplets of the form cause_concept - relation - effect. However, the relations are generally restricted to either positive or negative. In these models, the triplets are aggregated into a directed graph, the nodes of which are either connected by simple +/- relations or in the Kennedy case numerical weights. The input event or fact is then input into the system and the effects of inputs are propagated across the graph, with any resulting policy preferences being output. Alternatively the map itself is used for analysis.
The second category, models of groups, includes: UNCLESAM (Job & Johnson 1989) a group model of U.S. policy making in the Caribbean, CHINA_WATCHER (Tanaka 1984) a model of China's foreign policy responses to confrontations with her neighbors, JESSE (Sy'van et al. 1990) a group based model of Japanese elite energy decision making, Saudi Arabia (Anderson and Thorson 1982) a rule based model of Saudi Arabian decision making, a cognitive mapping based model of aggregate decision preferences in national policy groups applied to Norway (Bonham et al. 1978), a group based model of interaction between the People's Republic of China and Hong Kong (Katzenstein 1988), External Predisposition Model (Hudson 1983) a rule based model of state action based on factors external to the state, a rule based system that implements the behavior of states base on the theories of classical Realism (Cusack & Stoll 1990), and POLI (Taber 1992) a fuzzy logic expert system that estimates the position of three distinct groups of US legislators in the 1950's to model the foreign policy decision making of the United States for that period. Models in the second group are in general more complex than the first group, with several sub tasks performed to arrive at an output rather than the repetitive propagation of input values. This difference in sub task complexity may well be made up for in the generally more complex data structures to be found in the first group of models. In particular, CHINA_WATCHER, makes use of routines such as PRECEDENT (from the third group of models) to search for the actions and consequences of previous episodes in China's foreign relations to evaluate options, and CHINA_WATCHER also, "learns" by storing the current episode and its results into its case memory and updates its world model to take into account events.

The last group, models of social or cognitive processes includes: PRECEDENT (Alker et al. 1980) a model of Precedent based reasoning in international relations a rule based Prolog model of US/SU interactions during cold war 1945-80 (Banerjee 1986,
1991) and a rule based Prolog model of Kaplan's balance of power theories (Mefford 1986). PRECEDENT was developed at MIT as a general process for use in other models of international relations using a precedent based reasoning approach. Of particular interest is Bannerjee's social process model which seeks to reproduce the pattern of action between the United States and the Soviet Union based on the ability of social structures to reproduce themselves over time, due to the actions they engender. This is a somewhat controversial twist on an ongoing debate in international relations about the impact of individuals and so-called systemic variables in social interactions.

In this particular project, the use of computational techniques enables the study of foreign policy reasoning and problem representation in an on-line manner, and allows for different reasoning models to be tested quickly and compared with one another directly. Computational modeling techniques provide for the creation of dynamic simulations and for change in the content of the belief system in response to new situations and arguments.

As with all computer programming and computational modeling tasks, the design of the data structures and their permissible interactions will have repercussions for the rest of the model, and it is therefore important that psychological evidence about beliefs discussed in the previous chapter be taken into consideration in the design of belief data structures, and that the initial specification be subject to skeptical review as the project proceeds. Data structures for this model are based on the associative network models from Psychology discussed previously, but take advantage of the semantic network research in Artificial Intelligence. The associative network model was chosen over the trace memory model because it is a simpler system and can be extended to include both schema and trace models of memory, and perhaps episodic memory (see for example scripts, Abelson 1973). Using the associative model is therefore a logical choice and provides the groundwork for the
other models. Techniques from semantic network research\(^{15}\) were chosen to implement the model because the structure of semantic networks is complementary to the associative network model of memory. As discussed in the previous chapter, in the associative model memory is thought of as a graph structure of concepts and relationships (Figure 3).

Similarly in semantic nets, each node represents an object, concept or situation, and links represent relationships between the nodes. Semantic networks are very flexible data-structures and can be used for deductive inference by a process of inheritance, which is a mechanism whereby the attributes of concepts (nodes, i.e., Cuba) can be deduced from the attributes of class concepts (super ordinate nodes, i.e., communist-country) to which they are connected. Semantic networks are also useful because of powerful graph matching routines that are available to compare graphs or sub graphs and determine if the fragments match.\(^{16}\) The natural choice for representing this model of beliefs is a concept and pointer structure, and this was the data structure used initially (Young 1993a & 1993b). In this representation each concept becomes a data object with separate pointers for each possible coding relationship, of which there were 36. This data structure is illustrated in Figure 6, using part of the inaugural speech already excerpted previously. Unfortunately, this data structure has a major problem in that compound statements cannot easily be represented.

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\(^{15}\) Semantic network research grew out of work by Ross Quillian (1968) on language understanding as an attempt to represent human understanding of language in a computer usable form (see Jackson 1990 page 156). Since that original research semantic networks, renamed as conceptual graphs, have been studied as universal systems for knowledge representation (Sowa 1984) and the development of conceptual graph systems is now the goal of a large international research group collectively known as the PIERCE project (Ellis & Levinson 1992). A short and accessible introduction to conceptual graphs by Polovina & Heaton can be found in the May 1992 edition of AI Expert.

\(^{16}\) A very accessible introduction to graph theory is provided by Gary Chartrand (1977), Introductory Graph Theory.
As shown in Figure 6, the subordinate statements in compound statements become hidden within the concept data object and are not truly part of the problem representation. The inaccessibility of subordinate data statements obscures the complexity of the problem representation and creates difficulties for modeling the policy choice process (see Young 1993b) At the prompting of Gavan Duffy of Syracuse University, and with reference to Keil (1989) and Carey (1985), a new data structure has been devised which represents
relationships as data objects in their own right and reduces the pointers between data objects. This data structure is illustrated in Figure 7.

Simple Data Statement

concept-object \(\rightarrow\) relationship-object \(\rightarrow\) concept-object

\(\text{united-states} \rightarrow \text{attribute} \rightarrow \text{strong-abroad}\)

Compound data Statement

relationship-object

relationship-object

concept-object \(\rightarrow\) concept-object

relationship-object

relationship-object

concept-object \(\rightarrow\) concept-object

condition

\(\text{attribute} \rightarrow \text{united-states} \rightarrow \text{strong-abroad}\)

\(\text{attribute} \rightarrow \text{united-states} \rightarrow \text{strong-at-home}\)

Figure 7. Final Data Structure
While this data structure solves the problem of hidden subordinate data statements, the elevation of relationships from pointers to objects also provides the opportunity to represent the additional information about relationships captured by the truth-value and relationship modifier variables which could not be handled well in the previous data structure. Elevating relationships to the status of data objects also allows for the possibility of conjunctions as a special type of relationship. Each concept, conjunction, and relationship data object has associated with it, via a subject-of pointer, a list of the relationships it is the subject of and a second list of the relationships it is an object of accessed via an object-of pointer. In addition, conjunction and relationship objects have subject and object pointers for backward chaining. The subject and object pointers associate a list of the subjects and a list of the objects, respectively, of a relationship or conjunction. Lastly, relationship objects have salience, truth-value and modifier pointers to associate these additional pieces of information with each relationship. One disadvantage of this new data structure is that it remains difficult to code the beliefs of agents other than the author of the text, and beliefs such as a desire to be able to do something. A separate data object is generated from each concept, conjunction and relationship identified by the coder(s). Examples of the variety of structures which are derived from the speeches in the data set are shown in Figures 8-10. Figure 8 illustrates a simple cognitive map fragment, figure 9 illustrates a fragment with relationships as the object of another relationship, and figure 10 illustrates a fragment with a conjunction and several complex relationships. The figures are best read from left to right and top to bottom.
Figure 8. A Simple Cognitive Map Fragment.
Figure 9. Cognitive map fragment with relationships as objects of other relationships.
Figure 10. Cognitive map fragment illustrating a conjunction and complex relationships.
The compilation of individual data statements into a problem representation model is performed by a computer program written in Macintosh Common Lisp. The program takes as input the data statements created by a human coder, reading the items from text files and then compiles them into 'nodes' in the cognitive map. The system also allows for the creation of a synonym list that will replace concepts with a preferred synonym, this process takes places at run-time and does not change the data, but allows the analyst to compress the size of the nodes in the cognitive map by replacing redundant concepts. The synonym facility also allows the analyst to determine whether hypothesized redundancies in concepts will result in different policy choices when the thought to be synonymous concepts are combined.

Although the content analysis example is not very complex and the information can readily be gained from a quick reading of the text, these structures are extremely useful because they provide a manipulable cognitive map in memory that can be used to derive measures of problem representations, and serve as the basis of dynamic simulations. The use of an automated system also allows us to examine the data in a variety of ways, including checking for differences in the cognitive maps derived from texts aimed at different audiences, and the implications this has for consistent policy behavior, a procedure which would be extremely costly without using a data structure and compiler like those described here. In addition, the system can combine the information from several texts consisting of hundreds of data statements to provide a composite and complex map which is not readily amenable to unassisted analysis. Each cognitive map, once constructed, is stored as a named list of all the data objects in the map.
Measuring Change in Problem Representations

Seven measures are developed below to measure change across problem representations, and are used in the following chapter to analyze the foreign policy problem representation of President Carter. This set of measures is comprised of four structural measures; size, dependency, connectedness, and uniformity of salience, which characterize problem representations and provide indices of change, and three comparative measures; concept comparison, transformation cost and incongruence, which provide discrete measures of difference between problem representations. All seven measures for problem representations are also applicable to belief systems and cognitive structures in general. Each of these seven aspects of problem representations is expected to be related to the nature of foreign policy pursued by the foreign policy decision maker(s), and change in these measures should reflect types of change in the problem representation and precede specified types of changes in policy choices.

Structural Measures

Dependency

Dependency reflects the extent to which concepts are organized in ways that isolate lines of reasoning from one another. For example, although we might consider George Bush to have both military security and environmental protection as goals for the United States, the lines of reasoning and causal pathways leading to these two goals do not appear to have interacted, they were not interdependent. Bush’s policies suggest that these goals could be pursued relatively independently. Dependency has a range of 0 to 1, and is defined for a belief system, G, as:

\[ D_G = \frac{\sum \text{bridges}_G}{\sum \text{disconnected subgraphs}_G} \]

\[ \sum \text{relationships}_G \]
This formula captures the number of pathways (concept-relationship-concept) over which it is possible to travel from one concept to another in the belief system. If only one pathway exists (all the relationships are bridges) then $D = 1$ ($\Sigma$ bridges $= \Sigma$ relationships). Dependency is discounted for the number of disconnected structures in the belief system, because in a completely dependent system there would only be one cognitive structure with a single super ordinate concept.

The Dependency measure is considered important because change in very dependent systems is expected to be more localized than in interdependent systems. High dependency suggests that concepts are not laterally connected and are relatively distinct from each other, and this should also be true for policy areas. For example, a policy maker with a dependent problem representation can be expected to view policy actions as distinct from one another. It has been suggested for instance that the leaders of the Soviet Union in the 1970’s maintained distinctions between policies toward the United States and Europe and policies toward the Third World, and that this view clashed with more interdependent views held by United States policy makers, including President Carter (Spanier 1983:177).

Connectedness

Connectedness reflects the number of relationships between concepts in the problem representation and is similar to the Maoz and Shayer (1987) measure of the same name, and to Levi and Tetlock’s (1980) causal integration, both of which are considered to be indicators of cognitive complexity. Connectedness captures how interrelated the concepts and lines of reasoning are in the belief system.

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17 The use of connectedness in this context is similar in conception to that used by Maoz and Shayer (1987:591) in their study using Axelrod cognitive maps. Bonham, Shapiro, and Trumble (1979:20) provide a similar measure which they refer to as complexity (also used by Levi & Tetlock 1980:201), which is the ratio of causal
Connectedness has a range of 0 to 1 and is defined, as follow:

\[ C_G = \frac{\sum_{\text{relationships}_G}}{\sum_{\text{concepts}_G} + \sum_{\text{relationships}_G}} \]

This measure captures the extent to which concepts are associated with other concepts. If there are no relationships between concepts, then \( C = 0 \) (and \( D = 0 \)), if only relationships exist in the belief system then \( C = 1 \) (and \( D = 0 \)).

In contrast to more dependent belief systems, changes in highly connected belief systems will be reflected across larger numbers of concepts due to the larger number of connections (including lateral connections) between concepts. Policy makers with connected belief systems are also expected to have an integrating outlook and broadly based policies, with changes in the belief system reflected across several policy areas. This is because of the greater number of lateral connections that are expected to exist in more connected belief systems, and in particular lateral connections are expected between concepts on the bottom edge of the belief system.

**Size**

Size is the number of concepts in the belief system. The size of the problem representation is expected to be correlated with expertise where those more expert in a particular area are expected to have more concepts in a problem representation and they are expected to more easily relate these concepts to other concepts more distant in the problem representation. Size should also be related to situational factors such as stress, for example preliminary data from the Gulf War indicates that the foreign policy problem representation of President

relationships to concepts. However, that ratio is insensitive to the distribution of the relationships in the map, and is unbounded in range.
Bush was relatively small in size and lower in connectedness, in the period following the Gulf War.

**Uniformity of salience**

Uniformity of salience reflects the firmness with which each component belief is held in the problem representation, and also reflects the proposition that the relationships between concepts have a strength associated with them that becomes strengthened by experience. Uniform salience indicates that all the relationships in the belief system are equally resistant to change and equally likely to be used in reasoning. Varied salience indicates that some relatively high salience relationships are more resistant to change and more likely to be used in reasoning than other relatively low salience relationships. In the Carter Administration for example, human rights appears to have been highly salient to the President and was repeatedly referred to by him in connection with other concepts.

Uniformity of salience is measured with the mean of and the standard deviation in the strength of relationships in the belief system. The salience of any particular concept is indicated both by the strength of its relationships with other concepts, i.e., how ‘hot’ it is, and by the number of relationships it has with other concepts, i.e., the variety of its connections and the frequency of its use in reasoning. The uniformity of salience in the belief system is important as an indicator of whether an individual’s reasoning always leads to the same set of conclusions. Policy makers with a large deviation in the uniformity of salience are expected to be more consistent in their thinking and policy behavior. It is expected for example, that an analysis of John Foster Dulles’ speeches and comments would reveal a belief system with respect to the Soviet Union that had a few highly salient pathways which prompted the rejection of other lines of reasoning, i.e., the inherent bad faith model illustrated by Holsti (1962, 1970).
Comparative Measures

Concept Comparison

Concept Comparison indicates which particular concepts (and the relationships leading from them) are identical in both belief systems of interest, as well as those unique to each and common to both, but with different relationships. Concept comparisons include checking for the presence of the same concept and relationship structure in each of the represented belief systems, and changes in the inferences that follow from each problem representation. Concept comparison is intended as an aid to the analyst in determining why policy behavior has changed, by listing the specific areas of qualitative change in the problem representation.

Transformation Cost

Transformation Cost provides an indicator of change in problem representations that measures the amount of change (in a manner analogous to the amount of cognitive work required) between two problem representations. Transformation cost is implemented as a Levenshtein measure of difference (Mefford 1987) which is based on the number of adjustments (additions, deletions, etc.) required to transform one sequence into another. (While it may not be immediately obvious, the model of memory discussed previously can be represented in terms of a sequence of symbols or symbol expressions.) The transformation cost for two problem representations is a Levenshtein measure which calculates the minimum number of discrete changes required to make the second problem representation a duplicate of the first. There are five basic discrete changes each assigned a cost of 1:
(a) *Relationship-addition* is the creation of a relational link between two concepts.

(b) *Relationship-deletion* is the removal of a relational link between two concepts.
(c) Relationship salience increase/decrease is a unit change in the strength of a relationship between two concepts.

(d) Concept-deletion is the removal of a concept, is most likely to occur with peripheral concepts with only low salience relationships to other concepts, and requires that all relationships are deleted prior to concept deletion.
(e) Concept-addition is the creation of a new node that reflects the addition of new information into the belief system. Concept additions are expected to be accompanied by one or more relationship additions linking the new concept to at least one other concept.

The five basic discrete changes can also be used to define three composite classes of change:

1. Translocation (a relationship-deletion and a relationship-addition) is the movement of a concept or sub graph from one super ordinate concept to another. The policy consequences of this change will depend on the size of the sub graph which is translocated, and its new connections.

2. Transcendence (concept-addition and relationship-addition(s)) creates a concept super ordinate to existing concepts that incorporates discrepant information but maintains consistency at the higher level (Bonham, Shapiro & Trumble 1979; Bonham, Heradstvet, Narvessen, & Shapiro, 1978).
3. *Differentiation* (concept-addition and relationship-addition(s)) splits a concept into parts to preserve consistency in some area (Bonham, Shapiro & Trumble 1979; Bonham, Heradstviet, Narvessen, & Shapiro, 1978). This may involve creating a new subordinate concept for the concept which is being differentiated. This conceptualization of differentiation is parallel to the subtyping model of schema change discussed previously.

**Incongruence**

Both concept comparison and transformation cost are rather blunt instruments, best used to compare the problem representations of two or more different people on the same topic rather than a time series of problem representations for the same person. However, because the current data come from public speeches, the content of the measured problem representation may vary with the audience and topic of the address in ways not related to a change in the underlying problem representation. For example, were President Carter to have made a foreign policy speech in Kansas he might have chosen to discuss international grain subsidies, but he may not mention them at all in a speech given in Maine. To compensate as much as possible for this variation, the third comparative measure, incongruence, combines transformation cost and concept comparison and compares changes in relationships between concepts common to both problem representations. Incongruence is expected to have a relatively high value when we compare problem representations that precede large changes in behavior. For example, relatively large incongruence values would be expected for Nixon if we were to compare his representation of communism as Vice President and then again as President, reflecting his reassessment of China, prior to his initiation of contact.
While all of these measures are of theoretical interest, it is the comparative measure, incongruence, that is of particular interest. Incongruence is the most important measure for this study, because while it is possible for a modeled problem representation to change substantially yet still have the same values for the structural measures, incongruence is only zero for identical problem representations.

**Modeling Problem Representation**

Research in Artificial Intelligence has also produced results in a third area of interest to the Political Scientist, reasoning style. Reasoning style in the context of Artificial Intelligence can be considered to be an investigation into the evaluation functions used in the search through problem spaces, i.e. the method used to determine if a goal state has been reached. Three reasoning styles are of interest here, and each has its own assumptions about the type of data upon which it operates. The three styles are: explanation based reasoning, case based reasoning, and model based reasoning. None of these three models of reasoning are by necessity exclusive of the others. However, they do suggest that the style of reasoning employed by intelligent systems may well depend on the data available to them and the knowledge structures available in memory.

In explanation based reasoning (De Jong 1988), the data which is operated upon is essentially a proposition, i.e., a single causal or factual statement such as “fire is hot”. The task in explanation based reasoning is to discover a chain of propositions where the last proposition in the chain is the goal state, perhaps in this case “the meat is cooked”. Explanation based reasoning may well work by backward chaining from the goal to the current state (the problem), perhaps in this case “cook the meat”.

Case based reasoning (Mefford 1987), also known as analogical reasoning, takes as its data unit the case, which can be considered to be a compact bundle of information
associated with a concrete experience. Each such case contains a set of features that describe the case and include courses of action that were either successful or unsuccessful. The task in case based reasoning is to find a case similar to the current case (the problem) with an action that was successful and can be used or was unsuccessful and can be ruled out. The usefulness and power of case based routines is dependent on the coding of the cases and their ability to identify and assess the relevant features of cases. This problem remains an area of great interest to Artificial Intelligence researchers. The case based model also allows for adding the current case to the cases available for future problem solving.

Model based reasoning (Goel 1989) can be thought of as a hybrid of both explanation and case based reasoning, but at a higher level of abstraction. In model based reasoning, the data unit is the model which contains a group of related propositions under a general principle or law. The task in model based reasoning is similar to case based reasoning in that a match must be identified between the current state and a model, but at a level more akin to determining whether the domain is engineering or economics. Once a determination has been made, the values associated with the current state are input into the propositions contained in the model, which then indicate actions to be taken.

The model proposed for the generation of problem representations and of policy choice, most closely resembles explanation based reasoning, but is patterned after the work of Bonham and his colleagues (Bonham et al, 1979 and Bonham et al, 1978) on cognitive mapping. Bonham et al define a six step process which they label the Cognitive Process Model. 18 A modified version of this model, which also draws on the idea of end-state

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18 Cognitive Process Model

1. **Amplification** = match concepts in situation to belief system, generate lists of ‘highlighted’ concepts.
2. **Search for Antecedents** (paths) = find all prior causes of highlighted nodes, add to list of stored paths, search until no further parents can be found, i.e., back to super ordinate nodes.
evaluations and the rejection of unacceptable consequences described in Thorson and Sylvan (1982), is used as an initial estimate of former President Carter’s reasoning process.

The policy choice model uses spreading activation for generating the definition of the situation, but rejects spreading activation as a model for reasoning in a serial processing system, and uses an explanation based style of reasoning using a salience heuristic. The salience heuristic uses the strength of a proposition in a belief system to direct memory search. The search procedure selects the proposition with the highest salience to activate, carries out any indicated processing, then selects the most salient proposition leading from the conclusion of the just processed proposition and repeats the process until no further progress can be made, i.e., a policy is output, or new information is fully integrated into the cognitive map. The choice of an explanation based reasoning heuristic is by no means a rejection of case or model based reasoning, but is a tactical move. This tactic is designed to allow fairly rapid prototyping and an investigation into the ability of this style of reasoning to account for human Foreign Policy behavior. The policy choice process has three major steps that are described below in Figure 11. This model is fairly typical of descriptions of problem solving and is a simple means-ends procedure, as such the policy choice process model provides a first estimation of the process that connects beliefs and policy behavior.

3. Search for Consequences (paths) = walk map from highlighted nodes to terminal nodes, store paths.
4. Create a set of consistent paths = find most central path(s) remove paths inconsistent with this path, the remaining set of paths is considered to be the ‘explanation’ of the policy problem.
5. Search for Policy Alternatives = find all policy-concepts that are directly connected to all antecedent and consequent paths.
6. Choice of A Policy Alternative = select policy that leads to maximum gain in an ordered set of values (lexicographic search).

Cognitive Centrality of a concept = # of parents + # of children
Cognitive Centrality of a path = Σ cognitive centrality of concepts in the path
In summary, given that problem representations can be considered to be subsets of an individual's belief system that are constructed in response to stimuli, then a reasonable model for both belief systems and problem representations is the concept and relationship
structure modeled on the node and link structure of the associative network model of memory. The adoption of this theoretical structure for problem representations has led to the development of seven measures of problem representations at both the discrete and structural level (discrete measures: concept comparison, transformation cost, and incongruence; structural measures: dependency, connectedness, uniformity of salience, and size). These measures provides a means for measuring and tracking change in belief systems in general and of problem representations in particular and the effects of change on reasoning and individual behavior. The use of these measures, in particular incongruence, provides an additional source of information on the nature of the Carter Administration’s representation of the international system. When combined with the model of policy choice and problem representation generation, it is hoped that the implementation of this problem representation model will serve as a powerful source of explanation for the foreign policy of the United States under the leadership of President Carter, and provide insight into the relationship between beliefs and policy behavior.
CHAPTER IV

CARTER’S FOREIGN POLICY REPRESENTATION: EXPECTATIONS AND RESULTS

The foreign policy problem representation of President Carter is often characterized with reference to dramatic change, as epitomized by Carter’s interview response to a question about the Soviet invasion of Afghanistan asked by Frank Reynolds of ABC-TV on New Years eve 1979:

[T]his action of the Soviets has made a more dramatic change in my own opinion of what the Soviets ultimate goals are than anything they’ve done in the previous time I’ve been in office.

Sick 1986:242

This quote is often taken at face value to indicate a dramatic change in Carter’s beliefs about the Soviet Union and the international environment. Yet, while the change of behavior is well established (Sick 1986:242; Rosati 1987/91:142-149) is the change in beliefs? For example, the types of action Carter took following the invasion are foreshadowed in his previous speeches (emphasis added).

In the principles of self-restraint, reciprocity, and mutual accommodation of interests, if these are observed, then the United States and the Soviet Union will not only succeed in limiting weapons but will also create a foundation of better relations in other spheres of interest.

Carter 10/4/77

The major powers have a special responsibility to act with restraint in areas of the world where they have competing interests, because the association of these interests with local rivalries and conflicts can lead to serious confrontation.

In the Indian Ocean area, neither we nor the Soviet Union has a large military presence, nor is there a rapidly mounting competition between us.
Restraint in the area may well begin with a mutual effort to stabilize our presence and to avoid an escalation in military competition. Then both sides can consider how our military activities in the Indian Ocean, this whole area, might be even further reduced.

Carter 10/4/77

We are prepared, for instance, to cooperate with the Soviet Union toward common social, scientific, and economic goals. But if they fail to demonstrate restraint in missile programs and other force levels or in the projection of Soviet or proxy forces into other lands and continents, then popular support in the United States for such cooperation with, the Soviets will certainly erode.

Carter 3/17/78

Our long-standing concerns encompass our own security interests and those of our allies and friends far beyond our own shores and Europe. We have important historical responsibilities to enhance peace in East Asia, in the Middle East, in the Persian Gulf, and throughout our own hemisphere. Our preference in all these areas is to turn first to international agreements that reduce the overall level of arms and minimize the threat of conflict. But we have the will, and we will also maintain the capacity, to honor our commitments and to protect our interests in those critical areas.

Carter 3/17/78

In a democratic society, however, where public opinion is an integral factor in the shaping and implementation of foreign policy, we do recognize that tensions, sharp disputes, or threats to peace will complicate the quest for a successful agreement. This is not a matter of our preference but a simple recognition of fact. The Soviet Union can choose either confrontation or cooperation. The United States is adequately prepared to meet either choice. We would prefer cooperation through a détente that increasingly involves similar restraint for both sides; similar readiness to resolve disputes by negotiations, and not by violence; similar willingness to compete peacefully, and not militarily. Anything less than that is likely to undermine détente. And this is why I hope that no one will underestimate the concerns which I have expressed today. A competition without restraint and without shared rules will escalate into graver tensions, and our relationship as a whole with the Soviet Union will suffer.

Carter 6/7/78

Throughout his speeches Carter phrased comments about Soviet intentions in the conditional sense and did not directly link Soviet intentions to U.S. policy. Although this can be interpreted as an attempt to keep the Soviet Union in line by "putting them on notice," the impression left from a careful reading of these 22 speeches is of a complex
view of the world with clear goals but with a highly conditional foreign policy that was adaptive to change in the environment. A view supported by Gary Sick’s memoirs:

In retrospect, it seems clear that the Soviet leaders committed a blunder of historic proportion when they misjudged the depth of the U.S. reaction to their aggression in Afghanistan. Jimmy Carter and Cyrus Vance represented an important but often invisible dimension of U.S. attitudes toward the Soviet Union. They believed deeply in the importance of dialogue and mutual accommodation between the two superpowers on vital issues of peace and international security. They were not starry-eyed idealists about the USSR, but they were profoundly convinced that the way to peace was through careful communication and persistent discussion of issues rather than threats and bluster.

Sick 1986:342

In his own memoirs Carter says little about his reaction to the Soviet invasion, but it is clear that his beliefs about arms control remained unchanged.

There were some things I did not want to do; one of the most important of these was scuttling the SALT II treaty. It was patently of advantage to the United States and vital to the maintenance of world peace. On January 3, I sent a letter to Senator Robert Byrd, asking him not to bring it to the floor for a vote, but to leave it on the calendar for future action. Because of American disgust with the Soviet invasion, the treaty would have been defeated overwhelmingly, and to withdraw it from the Senate might have made it almost impossible to resubmit in the future of the most is its terms to continue to be observed. This action was the best I could do at the time to keep it alive.

Carter 1982:475

It also seems clear that Carter reassessed the Soviet Union, as indicated by his comments to Hamilton Jordan on December 28, 1979 comparing the invasion to the hostage crisis with Iran:

This is more serious, Hamilton. Capturing those Americans was an inhumane act committed by a bunch of radicals and condoned by a crazy old man. But this is deliberate aggression that calls into question détente and the way we have been doing business with the Soviets for the past decade. It raises grave questions about Soviet intentions and destroys any chance of getting the SALT treaty through the Senate. And that makes the prospects of nuclear war even greater.

Jordan 1982:99

and echoed in his diary entry for January 3, 1980:
This is the most serious international development that has occurred since I have been President, and unless the Soviets recognize that it has been counterproductive for them, we will face additional serious problems with invasion or subversions in the future.

Carter 1982:473

In contrast, other passages from his speeches suggest that Carter was aware of Soviet intentions prior to the invasion of Afghanistan.

There also has been an ominous inclination on the part of the Soviet Union to use its military power-to intervene in local conflicts, with advisers, with equipment, and with full logistical support and encouragement for mercenaries from other Communist countries, as we can observe today in Africa.

Carter 3/17/78

To be stable, to be supported by the American people, and to be a basis for widening the scope of cooperation, then détente must be broadly defined and truly reciprocal. Both nations must exercise restraint in troubled areas and in troubled times. Both must honor meticulously those agreements which have already been reached to widen cooperation, naturally and mutually limit nuclear arms production, permit the free movement of people and the expression of ideas, and to protect human rights. Neither of us should entertain the notion that military supremacy can be attained, or that transient military advantage can be politically exploited.

Carter 6/7/78

To the Soviet Union, détente seems to mean a continuing aggressive struggle for political advantage and increased influence in a variety of ways. The Soviet Union apparently sees military power and military assistance as the best means of expanding their influence abroad. Obviously areas of instability in the world provide a tempting target for this effort, and all too often they seem ready to exploit any such opportunity.

Carter 6/7/78

The Soviet Union attempts to export a totalitarian and repressive form of government, resulting in a closed society.

Carter 6/7/78

Thus far the evidence presented suggests either a dramatic change in Carter’s beliefs or no change in beliefs but rather a change in circumstances. Jerel Rosati in his study of Carter’s beliefs and policy behavior, presents a third alternative. Rosati (1987:153 ff.)
characterizes the change in the Carter Administration's representation of the international system as developmental, beginning in 1977 as complex and optimistic where the problem facing the administration was the construction of a global community, by 1980 the representation had turned pessimistic and the task was to protect United States security in an unstable international environment. The greatest changes are pinpointed in 1978/79 with the frustration of United States policy in the Horn of Africa. This characterization suggests that the change in the administration's (and Carter's) representation occurred as the result of the frustration of expectations and goals which prompted a reappraisal of the world, with resultant changes in factual beliefs (the state of the world) and causal beliefs (the effect of the world on the United State's security). Each of these three alternatives suggest different underlying processes of change -- no change, dramatic change at the end of 1979, and gradual change throughout the four year term -- each of which would be reflected in different results for the four structural measures: dependency, connectedness, size, and uniformity of salience, and also for the third comparative measure, incongruence. The absence of change in these measures over the course of Carter's Presidency would indicate that no change took place; change in the measures would support another of the alternatives. Change in Carter's representation should also be reflected in changes in the policy choice simulations for speeches in 1980.

The set of measures is applied to each of Carter's speeches as a whole, on the assumption that each speech contains Carter's representation of the international system at that point in time. The speeches do not contain problem representations per se. While they may indicate gaps between Carter's goal(s) and the current or expected state of the international system, they may also contain discussion of satisfactory aspects. However,

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19 Rosati's study deals with Carter, Vance, and Brzezinski.
given that each speech explains and supports Administration actions, they are representative of the relationships between objects in the international system and the actions the United States needs to take. Thus, the structure of this general representation should closely parallel the structure of specific problem representations, consisting of a subset of the beliefs in the belief system, that Carter generated in response to events in the international system. The policy-choice models provide additional information on the specific problem representations Carter would generate at each point in time given a Soviet invasion of Afghanistan. The specific expectations for the set of measures for each of the change alternatives is detailed below.
Expectations

Dependency

The developmental hypothesis would suggest that over the four years of Carter’s term dependency will increase as US foreign policy becomes more focused on US-Soviet policy, and areas of policy become distinct and less interdependent. As Carter moved from trying to build a global community, where all issues are connected, to security and US-Soviet policy, fewer policy issues should be of concern and they will lead directly to security policy. Alternatively, if this change occurred suddenly then dependency scores should increase sharply in 1980.

Connectedness

With developmental change, connectedness is expected to decline as Carter’s outlook changes from a broadly based and interrelated focus on global problems to a more specific focus on the Soviet Union and a hostile world. Reagan whose foreign policy focused more narrowly on communism would have a problem representation less connected but also more stable. Again, with sudden dramatic transformation of the problem representation, connectedness scores should decline suddenly.

Size

The expected results for size are more varied, since the invasion of Afghanistan can be considered a crisis, Carter can be expected to focus sharply on only those issues related to the crisis. However, if a permanent change in outlook has taken place then size scores should remain depressed throughout 1980. If not they should return to pre-December 1979 levels.
Uniformity of Salience

Uniformity of salience should decrease (mean salience and standard deviation of salience will increase) if Carter shifts from a broad complex outlook to one focused on the Soviet Union and Iran, and the most salient items are expected to change from human rights items to security items. Constant high uniformity of salience would indicate that all issues discussed are of equal importance and all beliefs are equally likely to be considered when interpreting the international environment. An increase focus on only a few issues should increase their salience relative to other issues and result in reduced uniformity of salience scores.

Incongruence

If, as many believe, President Carter’s problem representation changed dramatically following the Soviet entry into Afghanistan, and preceding any change in policy then incongruence is expected to be significantly higher measured across the intervention than within speeches given before or after the invasion (December 27th 1979). This is the expected result, since Carter himself is often quoted as saying that prior to the Soviet action he did not understand the Soviets, that his new understanding led to changes in policy. If this is an example of a frustration driven change in the Carter’s problem representation, then high incongruence scores will be accompanied by changes in belief “high” in the problem representation, including a reordering of change of goals and strategies. The incongruence measure will provide a string indicator of whether or not Carter’s problem representation underwent substantial change during his four years in office. Changes in President Carter’s policy toward the Soviet Union, following the entry into Afghanistan should be accompanied by changes in the modeled belief system with high incongruence compared to other changes.
Policy Choice

The motivation for the policy-choice model is to determine whether we can use the model of problem representation detailed in Chapter 1 to simulate the reasoning processes of political leaders, in particular Jimmy Carter, in foreign policy decision making. And to test this simulation by comparing actual and predicted foreign policy behavior. The policy choice model described earlier has been implemented alongside the belief system model (WorldView). Experience with a prototype of the WorldView system and the policy choice model suggested that unlimited spreading activation was not an effective method for guiding a reasoning model, therefore the choose-policy routine that implements the policy choice model now stops with the first goal found during spreading activation from the stimulus and then follows strategy relationships to determine specific policy preferences, and a second, linear or depth first reasoning routine called directed-walk has also been implemented for comparison with the policy-choice routine.

The best (and toughest) test of how successful these models are is to predict Carter’s response to the Soviet invasion of Afghanistan (December 27th 1979). This is done using the statement “soviet-union invade true present afghanistan” as initial input for each reasoning routine in two ways, for each speech separately and for each speech in a cumulative manner. If there was a dramatic change in the foreign policy problem representation of President Carter, and it is expressed in his speeches, then this should result in a corresponding change in the behavior of the models. The presence or absence of this change could be an indicator of the degree of change in Carter’s problem representation, and the correspondence with the numerical measures provides some evidence of the process validity of the model.
Results

Dependency

Overall, no statistically significant relationship exists between dependency and days in office (see Figure 12, and below), there is neither a sharp nor gradual increase in the dependency score over time.

Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>Std Coef</th>
<th>T</th>
<th>P(2 Tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.051</td>
<td>0.012</td>
<td>0.000</td>
<td>4.195</td>
<td>0.000</td>
</tr>
<tr>
<td>Day</td>
<td>0.000</td>
<td>0.000</td>
<td>0.212</td>
<td>1.000</td>
<td>0.971</td>
</tr>
</tbody>
</table>

Analysis Of Variance For Groups Before and After 12/28/79

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum-Of-Squares</th>
<th>Df</th>
<th>Mean-Square</th>
<th>F-Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>0.001</td>
<td>1</td>
<td>0.001</td>
<td>0.945</td>
<td>0.342</td>
</tr>
<tr>
<td>Error</td>
<td>0.021</td>
<td>20</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The dependency score varies quite dramatically from speech to speech, indicating structural change on this time scale, but no consistent trend exists. However what is interesting is that the two high scores for dependency are associated with two highly focused speeches, the first a speech to the United States Congress (Carter 9/18/78) on the Camp David Agreement and the second (Carter 1/4/80) on the Soviet invasion of Afghanistan, both very focused and highly ordered speeches. This is consistent with the prediction that a high dependency score would be associated with problem representations where isolated lines of policy are not laterally connected to other policy lines in the overall foreign policy strategy. Also consistent are the two low dependency scores which reflect discussions of several parallel
lines in the foreign policy strategy. It is also interesting that the last two speeches on national security show a large decrease in dependency, perhaps reflecting a decline in the attention narrowing effects of the Soviet invasion. This is difficult to assess because of the preexisting effects of the Iranian hostage crisis, however, it is true that Carter's speeches in 1980 do include increased references to the Soviet Union. (This is true only for broad policy speeches, Carter made a number of speeches throughout his term not analyzed for this project which focused on the Soviet Union and topics such as the Strategic Arms Limitation Treaty in which references to the Soviet Union occur in high frequency.)

While neither of the change hypotheses is supported, the general pattern of results does suggest that the dependency measure is valid, given that high and low scores correspond to focused and diffuse speeches respectively. The results are also consistent with the change of focus observed by Gary Sick:

Carter, more that any recent U.S. president, was prepared to walk a second mile in pursuit of nonviolent solutions to security problems. For Three years he stubbornly refused the advice of his more hawkish advisers in the hope that the USSR would respond to a historic opportunity to develop peaceful means of managing East-West competition. The Soviets, whose own historical experience provided scant basis to comprehend a policy founded on principles of mutual respect, chose to interpret U.S. policy as a policy of weakness, thus setting in motion a new round of confrontation and arms competition.

Sick 1986:242ff
Figure 12: Dependency of Days in Office on Various Events

- US-SU Relations
- Responsibilities in an interdependent world
- Camp David
- Afghanistan
- National Security

Dependency

Days in Office
**Connectedness**

Again, although there is no statistically significant relationship between connectedness and days in office (see below), indicating an absence of long term change, the pattern of results suggests a valid measurement.

**Regression Analysis**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>Std Coef</th>
<th>T</th>
<th>P(2 Tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.566</td>
<td>0.008</td>
<td>0.000</td>
<td>74.026</td>
<td>0.000</td>
</tr>
<tr>
<td>Day</td>
<td>0.000</td>
<td>0.000</td>
<td>0.098</td>
<td>1.000</td>
<td>0.442</td>
</tr>
</tbody>
</table>

**Analysis Of Variance For Groups Before and After 12/28/79**

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum-Of-Squares</th>
<th>Df</th>
<th>Mean-Square</th>
<th>F-Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>0.000</td>
<td>1</td>
<td>0.000</td>
<td>0.042</td>
<td>0.840</td>
</tr>
<tr>
<td>Error</td>
<td>0.008</td>
<td>20</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One interesting result is that the speech with the lowest connectedness (Carter 4/10/80) follows the Soviet invasion of Afghanistan and is on United States foreign policy in a changing world (Figure 13). One might speculate that the low connectedness score is due to confusion on Carter's part and within the Administration on how the various aspects of US foreign policy fit together with the dramatic change in the international environment. This confusion begins to subside in the next speech on national security, and by the last speech (Carter 8/21/80), which has the second highest connectedness score suggesting a highly linked view of national security needs, the confusion has completely dissipated. This last speech is also much higher that the previous national security speech (Carter 2/19/80) and inverse to the change in dependency between these speeches which further
supports the suggestion that national security policy, if not foreign policy in general had been restructured following some temporary confusion. The other high scores for connectedness include speeches on Problems That Face The US (Carter 10/4/77), National Security (Carter 3/17/78), and America's Purpose (Carter 2/20/79), which suggest a relatively clear and interconnected view of US foreign policy existed prior to 1980, providing some support for the hypothesis. The other low scores are for the 1978 State of the Union Address (Carter. 1/19/78), Camp David (Carter 9/18/78), and Responsibilities In An Interdependent World (Carter 10/1/78). The Camp David speech also has a high dependency score which suggests that the speech is highly linear, while the low scores of the other two speeches reflect the number of topics addressed. This suggests that the variance in connectedness is a reflection, at least in part, of the purpose of the speech rather than the connectedness of Carter's foreign policy problem representation at the time of any particular speech.
Size

While there is no overall decline in the number of unique concepts used in Carter's speeches, Carter did greatly reduce the number of concepts he used in his speech following the invasion of Afghanistan (Figure 14). This may be a reflection of the crisis nature of this speech, however, the size score quickly rebounds, indicating an absence of permanent change in Carter's foreign policy problem representation. In addition, as can be seen from the following pages (Figures 16 and 18), the Afghanistan speech does have the highest mean salience of all the speeches coded, although it does not have the maximum salience which is “United-States Enhance True + Goal Accommodation-With-The-Soviet-Union” in the June 7th 1978 speech on US-Soviet relations (Table 2) in which Carter uses a large number of concepts. Over the course of the 22 speeches studied, there was a steady increase in the cumulative number of concepts used. This is not unexpected as Carter accumulates more direct experience, and as more of his conceptual vocabulary is exposed over a number of speeches, and suggests that the size measure is accurately reflecting growth in Carter’s expressed conceptual vocabulary. The increase in concepts creates some problems for discrete comparative analysis as it is difficult to determine if the relationships between concepts are changing when concepts may not be common across any two speeches.
Uniformity of Salience

While mean salience does reach its maximum in the Afghanistan speech of January 4th 1980, followed by the rational security speech of August 21st 1980 (Figure 13) there is no statistically significant difference in the sets of speeches before and after the invasion, nor is there a trend across the data (see below).

Regression Analysis

Dep Var: Mean Salience  N: 22  Multiple R: 0.209  Squared Multiple R: 0.044
Adjusted Squared Multiple R: 0.000  Standard Error Of Estimate: 0.085

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>Std Coef</th>
<th>Tolerance</th>
<th>T</th>
<th>P(2 Tail)</th>
</tr>
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<tbody>
<tr>
<td>Constant</td>
<td>1.226</td>
<td>0.032</td>
<td>0.000</td>
<td></td>
<td>38.321</td>
<td>0.000</td>
</tr>
<tr>
<td>Day</td>
<td>0.000</td>
<td>0.000</td>
<td>0.209</td>
<td>1.000</td>
<td>0.958</td>
<td>0.350</td>
</tr>
</tbody>
</table>

Dep Var: Standard Deviation of Salience
N: 22  Multiple R: 0.075  Squared Multiple R: 0.006
Adjusted Squared Multiple R: 0.000  Standard Error Of Estimate: 0.345

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>Std Coef</th>
<th>Tolerance</th>
<th>T</th>
<th>P(2 Tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.972</td>
<td>0.130</td>
<td>0.000</td>
<td></td>
<td>7.481</td>
<td>0.000</td>
</tr>
<tr>
<td>Day</td>
<td>-0.000</td>
<td>0.000</td>
<td>-0.075</td>
<td>1.000</td>
<td>-0.336</td>
<td>0.740</td>
</tr>
</tbody>
</table>

Analysis Of Variance For Groups Before And After 12/28/79

Dep Var: Mean Salience  N: 22  Multiple R: 0.279  Squared Multiple R: 0.078

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum-Of-Squares</th>
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<th>F-Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>0.012</td>
<td>1</td>
<td>0.012</td>
<td>1.691</td>
<td>0.208</td>
</tr>
<tr>
<td>Error</td>
<td>0.139</td>
<td>20</td>
<td>0.007</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dep Var: Sd_sal  N: 22  Multiple R: 0.005  Squared Multiple R: 0.000

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum-Of-Squares</th>
<th>Df</th>
<th>Mean-Square</th>
<th>F-Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>0.000</td>
<td>1</td>
<td>0.000</td>
<td>0.000</td>
<td>0.983</td>
</tr>
<tr>
<td>Error</td>
<td>2.397</td>
<td>20</td>
<td>0.120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Once again, this indicates an absence of the type of change expected. It is interesting to note that the speech with the single most salient item (a score of 23) was contained in the speech with the largest standard deviation of salience (Figure 14), the June 7, 1978 speech which emphasized accommodation with the Soviet Union and testifies to Carter’s pre-invasion focus on peaceful cooperation.

Today I want to discuss one of the most important aspects of that international context the relationship between the world’s two greatest powers, the United States of America and the Soviet Union. We must realize that for a very long time our relationship with the Soviet Union will be competitive. That competition is to be constructive if we are successful. Instead it could be dangerous and politically disastrous. Then our relationship must be cooperative as well. We must avoid excessive swings in the public mood in our country—from euphoria when things are going well, to despair when they are not; from an exaggerated sense of compatibility with the Soviet Union, to open expressions of hostility. Détente between our two countries is central to world peace.

Carter 6/7/78.

Maximum salience in the Afghanistan speech is in fact relatively low and is associated with Carter’s insistence that the US will not supply the Soviet Union with all the grain ordered in more cooperative times. The relatively high scores in 1980 for the Afghanistan and national security speeches, which are largely devoted to the Soviet Union, versus the broader State of the Union Address and foreign policy speeches indicates that focused speeches exhibit less uniformity of salience than more wide ranging addresses.
Figure 17. Standard Deviation of Salience
Figure 18. Maximum Salience
One indicator of change that is clear in these results is a change in focus from Human Rights/Peace issues to security items. This is clearly captured by the results in which Human Right/Peace items are the most salient items in a 10:3 ratio prior to the invasion of Afghanistan and in a 2:1 ratio after the invasion (Table 2 below).

### Analysis Of Variance For Groups Before and After 12/28/79

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum-Of-Squares</th>
<th>Df</th>
<th>Mean-Square</th>
<th>F-Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>0.485</td>
<td>1</td>
<td>0.485</td>
<td>1.039</td>
<td>0.320</td>
</tr>
<tr>
<td>Error</td>
<td>9.333</td>
<td>20</td>
<td>0.467</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although, as shown above, the small (22) and unequal sample size does not warrant definitive conclusions, anecdotal accounts of Carter's staff also tend to support this evidence:

On New Year's Eve 1979, Jimmy Carter told Frank Reynolds of ABC-TV that "this action of the Soviets has made a more dramatic change in my own opinion of what the Soviets' ultimate goals are that anything they've done in the previous time I've been in office." The choice of words was infelicitous, and it earned him derisive criticism for his alleged naiveté about Soviet behavior. However, the import of Carter's words was unmistakable to those in the policy community. The statement was, in effect, a public admission of the failure of quiet diplomacy and patient, non-belligerent negotiation of differences that he and Vance had adopted as the cornerstone of their policy toward the Soviet Union, and it clearly presaged a shift in those policies to a more confrontational approach.

Sick 1986:342

The prevalence of economic sanctions as the most salient item for the three speeches following the Soviet invasion hints at either a strong preference for economic responses to crises or a strong aversion to military action (Sick 1986:342), a conclusion supported by Carter's reluctance to intervene militarily in Iran (Sick 1986:204, 331, 329-356). It also undoubtedly reflects the risk of any direct military intervention in Afghanistan, as noted by Carter (1982:473) "Direct military action on our part was not advisable." In addition, this
trend is further supported by a trend, from international to domestic, in the type of audience Carter spoke to, 4:2 international:domestic in 1977, 2:3 in 1978, 0:1 in 1979, and 1:3 in 1980. This includes two addresses to the American Legion in 1980 an audience well suited to the security topic addressed by Carter. Initially the audience of each speech was examined to determine if there were any consistent audience effects on the structural measures (there are none), but instead it appears Carter choose his audience according to the message he wished to present rather than the audience affecting the message.
<table>
<thead>
<tr>
<th>Speech</th>
<th>Most Salient Item</th>
<th>Category (score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/20/77</td>
<td>United-States Perform True +Goal Our-Best-In-A-Spirit-Of-Individual-Sacrifice-For-The-Common-Good</td>
<td>HR/P (12)</td>
</tr>
<tr>
<td>3/17/77</td>
<td>United-States Cause True +Goal (United-States-Deficiencies-In-The-Area-Of-Human-Rights Attribute False Present Exist)</td>
<td>HR/P (9)</td>
</tr>
<tr>
<td>4/14/77</td>
<td>isolation - True Present Best-Interests-Of-Nations-Of-The-New-World-And-Other-Countries</td>
<td>(11)</td>
</tr>
<tr>
<td>5/22/77</td>
<td>United-States Enhance True +Goal Bonds-Among-Democracies</td>
<td>Security (13)</td>
</tr>
<tr>
<td>7/21/77</td>
<td>New-Developments-In-Technology + True Present New-Concerns</td>
<td>Security (4)</td>
</tr>
<tr>
<td>10/4/77</td>
<td>Peace-In-The-Middle-East Part-Of True +Goal Binding-Treaties</td>
<td>HR/P (10)</td>
</tr>
<tr>
<td>11/0/77</td>
<td>Peace-In-The-Middle-East Attribute True +Goal Exist</td>
<td>HR/P (16)</td>
</tr>
<tr>
<td>1/4/78</td>
<td>Democratic-Nations Confront True +Goal Economic-Challenge</td>
<td>(13)</td>
</tr>
<tr>
<td>1/19/78</td>
<td>United-States Ratify Possible Present Panama-Canal-Treaties</td>
<td>(4)</td>
</tr>
<tr>
<td>3/17/78</td>
<td>United-States Cause True +Goal Peace-In-The-Middle-East</td>
<td>HR/P (6)</td>
</tr>
<tr>
<td>4/1/78</td>
<td>Africa Attribute True +Goal At-Peace</td>
<td>HR/P (10)</td>
</tr>
<tr>
<td>6/7/78</td>
<td>United-States Enhance True +Goal Accommodation-With-The-Soviet-Union</td>
<td>HR/P (23)</td>
</tr>
<tr>
<td>9/18/78</td>
<td>The-World Attribute True +Goal Peaceful</td>
<td>HR/P (4)</td>
</tr>
<tr>
<td>10/4/78</td>
<td>(Power Attribute True Hypothetical Abused) If-Then True Present</td>
<td>HR/P (5)</td>
</tr>
<tr>
<td></td>
<td>(Power Attribute False Hypothetical Maintained)</td>
<td></td>
</tr>
<tr>
<td>2/20/79</td>
<td>Soviet-Union Enhance Possible Present Number-Of-Warheads-On-Large-Land-Based-Missiles</td>
<td>Security (6)</td>
</tr>
<tr>
<td>1/4/80</td>
<td>United-States Sell False Future 17-Million-Tons-Of-Grain-Ordered-By-The-Soviet-Union-In-Excess-Of-That-Amount-Which-We-Are-Commited-To-Sell</td>
<td>(9)</td>
</tr>
<tr>
<td>1/23/80</td>
<td>United-States Impose True Present Stiff-Economic-Penalties</td>
<td>(7)</td>
</tr>
<tr>
<td>2/19/80</td>
<td>Soviet-Union Perform True Present Paying-A-High-Price</td>
<td>(8)</td>
</tr>
<tr>
<td>4/10/80</td>
<td>United-States Enhance True +Goal Peace</td>
<td>HR/P (7)</td>
</tr>
<tr>
<td>8/21/80</td>
<td>Jimmy-Carter Enhance True Past Cruise-Missiles</td>
<td>Security (12)</td>
</tr>
</tbody>
</table>
Incongruence

Although there is a statistically significant difference (see below) in the incongruence of the groups of speeches before and after the invasion of Afghanistan, the change is not in the direction predicted, and incongruence is greater for the group of speeches given after January 1st 1980, than those before that date and greater then the incongruence between groups.

Analysis Of Variance For Groups Before and After 12/28/79

Dep Var: Incongruence  N: 130  Multiple R: 0.414  Squared Multiple R: 0.171

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum-Of-Squares</th>
<th>Df</th>
<th>Mean-Square</th>
<th>F-Ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1085031.529</td>
<td>1</td>
<td>1085031.529</td>
<td>26.460</td>
<td>0.000</td>
</tr>
<tr>
<td>Error</td>
<td>5248913.002</td>
<td>128</td>
<td>41007.133</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The expectation was that incongruence would be constant or that incongruence for speeches after the invasion would be less than incongruence between the groups or within the group of speeches given prior to the invasion, indicating greater focus and constancy within the post-invasion speeches. One possible explanation for this is simply that the small number of speeches analyzed in 1980 produced a biased sample. The maximum incongruence for the 1980 speeches does not exceed the maximum for speeches prior to 1980. This difference may also reflect the difficulty of reconciling new policy toward the Soviet Union with established policy in other areas. One possibility, that the ‘invasion’ speeches, due to the crisis context differed from the other post invasion speeches on more general topics is not supported by the evidence, the crisis speeches are not more different from the other post invasion speeches than any other pair of post-invasion speeches (the scores are right in the middle of the range).

An additional possibility is supported by the results for the connectedness scores of the post-invasion speeches. The connectedness scores appear to indicate a degree of
confusion in policy across the post-invasion speeches and high incongruence among theses speeches is consistent with this result, as high incongruence indicates very dissimilar content across the speeches reinforcing a sense of confusion. However surprising these results are, confidence in the implementation of incongruence remains high, because repeated testing of the incongruence routine confirms that it correctly measures differences between the data structures used in the WorldView system.
**Figure 19. Incongruence Among Groups of Speeches**

**Relationships Between Measures**

Two large and significant correlations (p < .001, two tailed) exist between the structural measures, dependency * size and mean salience * standard deviation of salience. The latter can be explained by the increase in range of salience which accompanies increased mean salience, thus standard deviation of salience will be a more useful measure for speeches with similar ranges for salience. The first correlation between dependency and size is not surprising for speeches with a "low" number of unique concepts. The small number of concepts reduces the probability of relationships with other concepts and increases the likelihood that the expressed relationship resulted in the concepts encoding will be the only relationship for the two concepts, thereby increasing dependency.
However this correlation is expected to become weaker as size (number of concepts) increases and the opportunities for relationships between concepts also increases.

Table 2. Pearson Correlations For Structural Measures

<table>
<thead>
<tr>
<th></th>
<th>Day in Office</th>
<th>Size</th>
<th>Dependency</th>
<th>Connectedness</th>
<th>Mean Salience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>-0.060</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependency</td>
<td>0.212</td>
<td>-0.734*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectedness</td>
<td>0.098</td>
<td>0.216</td>
<td>-0.065</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Salience</td>
<td>0.209</td>
<td>0.117</td>
<td>0.120</td>
<td>0.491</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation of Salience</td>
<td>-0.075</td>
<td>0.212</td>
<td>-0.031</td>
<td>0.421</td>
<td>0.762*</td>
</tr>
</tbody>
</table>

Number Of Observations:22

One other point of note in consideration of these numerical results is that they are highly sensitive to the contents of the synonym list created by the analyst, changes in the synonym-list are quite capable of altering the relative position of scores in the time series, and of changing the salience scores. This requires the analyst to take care in generating the synonym list and running any tests with as many versions of the synonym list as required to determine that any difficult synonym decisions do not materially reflect the results, and if they do to report these differences. It was fortunate in this research that changes in the synonym list used resulted from discovering missed synonyms, which were easily recognized rather than from difficult decisions. As illustrated in the discussion of the reasoning simulations below, some remained even after repeated checks.

Overall the numerical results of the structural measures can be summarized as supporting the ‘no change’ alternative for President Carter’s foreign policy problem representation. The exception to this is an apparent period of foreign policy confusion in the first half of 1980 as indicated by the connectedness and incongruence scores. In addition, for the “critical case” of the Afghanistan speech some of the change hypotheses do hold; dependency is high, size is low, and uniformity of salience is low. Of the
remaining measures, connectedness has a medium rather than low value which may be the
result of the small size of the speech, and the initial trend in 1980 is downwards.

Results from Policy Choice Models

A total of four simulations were conducted for policy choice. Each of the two
reasoning models, choose-policy and directed-walk, were applied to each speech separately
and in a chronologically cumulative manner. The results of these simulations appear below
in a condensed format (Tables 4-7). At first glance these results are unimpressive. At no
time prior to Carter’s own announcements does either model come close to predicting US
foreign policy response to the Soviet invasion. However, the results do demonstrate our
ability using the WorldView coding and representation system to model the foreign policy
reasoning of leaders.

In the cumulative analysis both the choose-policy routine and the depth first routine,
directed-walk, demonstrate strengths that the other lacks. The choose-policy routine, while
failing to “understand” the significance of the input statement, faithfully reports US goals
associated with its subject (the Soviet Union), such as the reduction of arms exports,
enhancement of human rights, and the reduction of nuclear proliferation. This can be seen
in an excerpt from Table 3 below:

Goal Found!

(Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-
Exports-To-The-Troubled-Areas-Of-The-World)

Goal Not Satisfied Selecting Strategy...

No Strategies For This Goal.
(Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-Exports-To-The-Troubled-Areas-Of-The-World)

Is The Object Of:

(United-States Cause True +Goal (Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-Exports-To-The-Troubled-Areas-Of-The-World))

In this example, the routine starts by reporting that a goal has been found that is associated with the input statement, and then prints out that goal statement. The routine then searches for strategies associated with this goal, and reports its failure to locate any. Following this the routine prints out a relationship which has the goal statement as its object, as a way of providing some additional information to the analyst.

The directed-walk routine on the other hand demonstrates the ability to generalize. This generalization is achieved by the use of the is-a relationship to determine if concepts used for reasoning are members of classes of concepts for which additional information is available. This can be seen in the following excerpt from Table 5:

(Soviet-Union Invade True Present Afghanistan)

(Soviet-Union Is-A True Present Industrial-Giant)

(Industrial-Giant Invade True Present Afghanistan)

End Of Walk.

In this example, the directed-walk routine fails to find anything directly applicable to the input statement and therefore searches for further information discovering that the Soviet-Union is an industrial-giant. The routine substitutes this information into the input
statement and attempts to reason from this new statement, failing to proceed further, the routine searches for new information again. This second search can be seen clearly in the sample below, where upon finding no connections to (Permanent-Member-Of-The-United-Nations-Security-Council Invade True Present Afghanistan) directed-walk searches again and discovers that Afghanistan is a sovereign-nation. This results in (Permanent-Member-Of-The-United-Nations-Security-Council Invade True Present sovereign-nation), and another search is made for associated information although without success.

(Soviet-Union Invade True Present Afghanistan)
(Soviet-Union Is-A True Present Permanent-Member-Of-The-United-Nations-Security-Council)
(Permanent-Member-Of-The-United-Nations-Security-Council Invade True Present Afghanistan)
(Afghanistan Is-A True Present Sovereign-Nation)
(Permanent-Member-Of-The-United-Nations-Security-Council Invade True Present Sovereign-Nation)
End Of Walk.

The directed-walk routine appears to be broadly more successful than the choose-policy routine in coming to the conclusion that Carter's primary reaction to the invasion is to desire the removal of Soviet invasion forces from Afghanistan, rather than convincing the Soviet Union that it cannot maintain an advantage over the United States, although they both may have been highly related in Carter's problem representation.
Table 3. Choose-Policy for each Speech With "soviet-union invade true present afghanistan" as Initial Input.

<table>
<thead>
<tr>
<th>Speech</th>
<th>Output of Choose-Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter 1/20/77</td>
<td>None of the concepts or relationships in the input are in the problem representation contained in the speech.</td>
</tr>
</tbody>
</table>
| Carter 3/17/77| Goal Found!  
(Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-Exports-To-The-Troubled-Areas-Of-The-World)  
Goal Not Satisfied  
Selecting Strategy...  
No Strategies For This Goal.  
(Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-Exports-To-The-Troubled-Areas-Of-The-World)  
Is The Object Of:  
(United-States Cause True +Goal (Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-Exports-To-The-Troubled-Areas-Of-The-World)) |
| Carter 4/14/77| None of the concepts or relationships in the input are in the problem representation contained in the speech.                                            |
| Carter 5/22/77| Goal Found!  
(Soviet-Union Know True +Goal (One-Country Impose Impossible Present System-Of-Society))  
Goal Not Satisfied  
Selecting Strategy...  
No Strategies For This Goal. |
| Carter 7/21/77| Goal Found!  
(Soviet-Union Assist True +Goal Growing-Pattern-Of-International-Activities-Designed-To-Deal-With-Human-Problems)  
Goal Not Satisfied  
Selecting Strategy...  
No Strategies For This Goal. |
| Carter 10/4/77| Goal Found!  
(And United-States Soviet-Union) Limit True +Goal (Military-Presence Location True Present Indian-Ocean))  
Goal Not Satisfied  
Selecting Strategy...  
No Strategies For This Goal. |
| Carter 11/2/77| Goal Found!  
(Soviet-Union Reduce True +Goal Testing-Of-Nuclear-Explosives)  
Goal Not Satisfied  
Selecting Strategy...  
No Strategies For This Goal.  
(Soviet-Union Reduce True +Goal Testing-Of-Nuclear-Explosives)  
Is The Object Of:  
( President-Brezhnev Assert True Past (Soviet-Union Reduce True +Goal Testing-Of-Nuclear-Explosives) ) |
<p>| Carter 1/4/78 | None of the concepts or relationships in the input are in the problem representation contained in the speech.                                           |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Carter 1/19/78 | Goal Found!  
(United-States Reduce True +Goal Conflicts)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(United-States Reduce True +Goal Conflicts)  
Is The Object Of:  
(United-States-Foreign-Policy Enhance True +Goal (United-States Reduce True +Goal Conflicts)) |
| Carter 3/17/78 | Goal Found!  
(Soviet-Union Perform False +Goal Soviet-First-Strike)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(Soviet-Union Perform False +Goal Soviet-First-Strike)  
Is The Object Of:  
(United-States Cause True +Goal (Soviet-Union Perform False +Goal Soviet-First-Strike)) |
| Carter 4/1/78 | None of the concepts or relationships in the input are in the problem representation contained in the speech.                                                                                           |
| Carter 6/7/78 | Goal Found!  
(Soviet-Union Know True +Goal (Disruptive-Behavior + True Present Costs))  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal. |
| Carter 9/18/78 | None of the concepts or relationships in the input are in the problem representation contained in the speech.                                                                                           |
| Carter 10/1/78 | Goal Found!  
(United-States Enhance True +Goal A-Free-Political-And-Economic-System)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(United-States Enhance True +Goal A-Free-Political-And-Economic-System)  
Is The Object Of:  
((United-States Enhance True +Goal The-World) Strategy True Present (United-States Enhance True +Goal A-Free-Political-Aad-Economic-System)) |
| Carter 1/23/79 | Goal Found!  
(Soviet-Union Negotiate True +Goal Salt)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal. |
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
</table>
| Carter 2/20/79 | Goal Found!  
(Salt-II-Agreement Attribute True +Goal Exist)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(Salt-II-Agreement Attribute True +Goal Exist)  
Is The Object Of:  
((And United-States Soviet-Union) Compete True Future Elsewhere-In-The-World) Warrant-For True Present (Salt-II-Agreement Attribute True +Goal Exist)) |
| Carter 1/4/80  | Goal Found!  
(Soviet-Troops Withdraw True +Goal Afghanistan)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(Soviet-Troops Withdraw True +Goal Afghanistan)  
Is The Object Of:  
(United-Nations Request True +Goal (Soviet-Troops Withdraw True +Goal Afghanistan)) |
| Carter 1/23/80 | Goal Found!  
(Soviet-Troops Withdraw True +Goal Afghanistan)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(Soviet-Troops Withdraw True +Goal Afghanistan)  
Is The Object Of:  
(Vast-Majority-Of-Nations-On-Earth Request True Past (Soviet-Troops Withdraw True +Goal Afghanistan)) |
| Carter 2/19/80 | Goal Found!  
(United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
Is The Object Of:  
((Soviet-Union Invade True Present Afghanistan) Warrant-For True Present (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)) |
| Carter 4/10/80 | Goal Found!  
(Soviet-Union Withdraw True +Goal Afghanistan)  
Goal Not Satisfied Selecting Strategy...  
No Strategies For This Goal.  
(Soviet-Union Withdraw True +Goal Afghanistan)  
Is The Object Of:  
((And United-States 103-Other-Members-Of-The-United-Nations) Request True Present (Soviet-Union Withdraw True +Goal Afghanistan)) |
<table>
<thead>
<tr>
<th>Date</th>
<th>Scenario Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter 8/21/80</td>
<td>Goal Found! (Soviet-Union Know True + Goal (Soviet-Union Possess Impossible Present Advantage-Over-The-United-States-Of-America)) Goal Not Satisfied Selecting Strategy... No Strategies For This Goal. (Soviet-Union Know True + Goal (Soviet-Union Possess Impossible Present Advantage-Over-The-United-States-Of-America)) Is The Object Of: (United-States-Strategy + True + Goal (Soviet-Union Know True + Goal (Soviet-Union Possess Impossible Present Advantage-Over-The-United-States-Of-America)))</td>
</tr>
</tbody>
</table>
Table 4. Choose-Policy For Cumulative Speeches With "soviet-union invade true present afghanistan" As The Initial Input.

<table>
<thead>
<tr>
<th>Speech (Cumulative)</th>
<th>Output of Choose-Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter 1/20/77</td>
<td>None of the concepts or relationships in the input are in the problem representation contained in the speech.</td>
</tr>
<tr>
<td>Carter 3/17/77</td>
<td>Goal Found!</td>
</tr>
<tr>
<td>Carter 4/14/77</td>
<td>(Soviet-Union Accept Possible +Goal Agreement-With-United-States-On-Arms-Exports-To-The-Troubled-Areas-Of-The-World)</td>
</tr>
<tr>
<td></td>
<td>Goal Not Satisfied Selecting Strategy...</td>
</tr>
<tr>
<td></td>
<td>No Strategies For This Goal.</td>
</tr>
<tr>
<td>Carter 5/22/77</td>
<td>Goal Found!</td>
</tr>
<tr>
<td>Carter 7/21/77</td>
<td>(Soviet-Union Know True +Goal (One-Country Impose Impossible Present System-Of-Society))</td>
</tr>
<tr>
<td>Carter 10/4/77</td>
<td>Goal Not Satisfied Selecting Strategy...</td>
</tr>
<tr>
<td></td>
<td>No Strategies For This Goal.</td>
</tr>
<tr>
<td>Carter 11/2/77</td>
<td>Goal Found!</td>
</tr>
<tr>
<td>Carter 1/4/78</td>
<td>(Soviet-Union Reduce True +Goal Testing-Of-Nuclear-Explosives)</td>
</tr>
<tr>
<td>Carter 1/19/78</td>
<td>Goal Not Satisfied Selecting Strategy...</td>
</tr>
<tr>
<td></td>
<td>No Strategies For This Goal.</td>
</tr>
<tr>
<td>Carter 3/17/78</td>
<td>Goal Found!</td>
</tr>
<tr>
<td>Carter 4/1/78</td>
<td>(Soviet-Union Perform False +Goal Soviet-First-Strike)</td>
</tr>
<tr>
<td></td>
<td>Goal Not Satisfied Selecting Strategy...</td>
</tr>
<tr>
<td></td>
<td>No Strategies For This Goal.</td>
</tr>
<tr>
<td>Carter 6/7/78</td>
<td>Goal Found!</td>
</tr>
<tr>
<td>Carter 9/18/78</td>
<td>(Soviet-Union Know True +Goal (Disruptive-Behavior + True Present Costs))</td>
</tr>
<tr>
<td>Carter 10/1/78</td>
<td>Goal Not Satisfied Selecting Strategy...</td>
</tr>
<tr>
<td></td>
<td>No Strategies For This Goal.</td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Carter 1/23/79 | Goal Found!  
  (Soviet-Union Negotiate True +Goal Salt)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal. |
| Carter 2/20/79 | Goal Found!  
  (Soviet-Troops Withdraw True +Goal Afghanistan)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (Soviet-Troops Withdraw True +Goal Afghanistan)  
  Is The Object Of:  
  (United-Nations Request True +Goal (Soviet-Troops Withdraw True +Goal Afghanistan)) |
| Carter 1/4/80 | Goal Found!  
  (Soviet-Troops Withdraw True +Goal Afghanistan)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (Soviet-Troops Withdraw True +Goal Afghanistan)  
  Is The Object Of:  
  (Vast-Majority-Of-Nations-On-Earth Request True Past (Soviet-Troops Withdraw True +Goal Afghanistan)) |
| Carter 1/23/80 | Change In Established Belief!  
  From: (United-States Cause True Present Mx-Missile-System)  
  To: (United-States Cause True Past Mx-Missile-System)  
  Goal Found!  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Is The Object Of:  
  ((Soviet-Union Invade True Present Afghanistan) Warrant-For True Present (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)) |
| Carter 2/19/80 | Goal Found!  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Is The Object Of:  
  ((Soviet-Union Invade True Present Afghanistan) Warrant-For True Present (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)) |
| Carter 4/10/80 | Goal Found!  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Is The Object Of:  
  ((Soviet-Union Invade True Present Afghanistan) Warrant-For True Present (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)) |
| Carter 5/9/80 | Change In Established Belief!  
  From: (United-States Enhance True Present United-States-Strategic-Capability)  
  To: (United-States Enhance True Past United-States-Strategic-Capability)  
  Goal Found!  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Is The Object Of:  
  ((Soviet-Union Invade True Present Afghanistan) Warrant-For True Present (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)) |
| Carter 8/21/80 | Change In Established Belief!  
  From: (United-States Enhance True Present United-States-Strategic-Capability)  
  To: (United-States Enhance True Past United-States-Strategic-Capability)  
  Goal Found!  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Goal Not Satisfied Selecting Strategy...  
  No Strategies For This Goal.  
  (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)  
  Is The Object Of:  
  ((Soviet-Union Invade True Present Afghanistan) Warrant-For True Present (United-States Enhance True +Goal Mutual-Constraint-On-Nuclear-Weapons)) |
Table 5. Directed-Walk For Each Speech With "soviet-union invade true present afghanistan" as initial Input.

<table>
<thead>
<tr>
<th>Speech</th>
<th>Output of Directed-Walk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter 1/20/77</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 3/17/77</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 4/14/77</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 5/22/77</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 7/21/77</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Is-A True Present Industrial-Giant)</td>
</tr>
<tr>
<td></td>
<td>(Industrial-Giant Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 10/4/77</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Is-A True Present Nuclear-Supplier-Nation)</td>
</tr>
<tr>
<td></td>
<td>(Nuclear-Supplier-Nation Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 11/2/77</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 1/4/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/19/78</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 3/17/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 4/1/78</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 6/7/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 9/18/78</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 10/1/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/23/79</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td>Carter 2/20/79</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/4/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Is-A True Present Permanent-Member-Of-The-United-Nations-Security-Council)</td>
</tr>
<tr>
<td></td>
<td>(Permanent-Member-Of-The-United-Nations-Security-Council Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Afghanistan Is-A True Present Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>(Permanent-Member-Of-The-United-Nations-Security-Council Invade True Present Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/23/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Date</td>
<td>Scenario</td>
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</tr>
<tr>
<td>2/19/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>((Soviet-Union Invade True Present Afghanistan) - True Present The-Careful-</td>
</tr>
<tr>
<td></td>
<td>(((Soviet-Union Invade True Present Afghanistan) - True Present The-Careful-</td>
</tr>
<tr>
<td></td>
<td>Warrant-For True Present</td>
</tr>
<tr>
<td></td>
<td>((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True</td>
</tr>
<tr>
<td></td>
<td>Present (Soviet-Invading-Forces Withdraw True +Goal Afghanistan))</td>
</tr>
<tr>
<td></td>
<td>((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True</td>
</tr>
<tr>
<td></td>
<td>Present (Soviet-Invading-Forces Withdraw True +Goal Afghanistan))</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Invading-Forces Withdraw True +Goal Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Afghanistan Enhance True +Goal Freedom)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk</td>
</tr>
<tr>
<td>4/10/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk</td>
</tr>
<tr>
<td>5/9/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Afghanistan Attribute Possible Present Launching-Pad-For-Future-Incursions)</td>
</tr>
<tr>
<td></td>
<td>((Afghanistan Attribute Possible Present Launching-Pad-For-Future-Incursions) - True Present Iran-Security)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk</td>
</tr>
<tr>
<td>8/21/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Afghanistan Attribute True Present Wedge-Pointed-At-The-Sea-Lanes-Of-The-</td>
</tr>
<tr>
<td></td>
<td>Persian-Gulf-And-To-The-Rich-Oil-Deposits)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk</td>
</tr>
</tbody>
</table>
Table 6. Directed-Walk For Cumulative Speeches With "soviet-union invade true present afghanistan" as Initial Input.

<table>
<thead>
<tr>
<th>Speech</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter 1/20/77</td>
<td>(Soviet-Union Invade True Present Afghanistan) End Of Walk.</td>
</tr>
<tr>
<td>Carter 3/17/77</td>
<td>(Soviet-Union Invade True Present Afghanistan) End Of Walk.</td>
</tr>
<tr>
<td>Carter 4/14/77</td>
<td>(Soviet-Union Invade True Present Afghanistan) End Of Walk.</td>
</tr>
<tr>
<td>Carter 5/22/77</td>
<td>(Soviet-Union Invade True Present Afghanistan) End Of Walk.</td>
</tr>
<tr>
<td>Carter 7/21/77</td>
<td>(Soviet-Union Invade True Present Afghanistan) End Of Walk.</td>
</tr>
<tr>
<td>Carter 11/2/77</td>
<td>(Industrial-Giant Invade True Present Afghanistan) End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/4/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/19/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 3/17/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 4/1/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 6/7/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 9/18/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 10/1/78</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 2/20/79</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 1/23/80</td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Date</td>
<td>Change In Established Belief</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Carter 2/19/80</td>
<td>From: (United-States Cause True Present Mx-Missile-System) To: (United-States Cause True Past Mx-Missile-System)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>Warrant-For True Present</td>
</tr>
<tr>
<td></td>
<td>(((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True Present (Soviet-Invading-Forces Withdraw True +Goal Afghanistan)))</td>
</tr>
<tr>
<td></td>
<td>(((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True Present (Soviet-Invading-Forces Withdraw True +Goal Afghanistan)))</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Invading-Forces Withdraw True +Goal Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Afghanistan Is-A True Present Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 4/10/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>Warrant-For True Present</td>
</tr>
<tr>
<td></td>
<td>(((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True Present (Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation)))</td>
</tr>
<tr>
<td></td>
<td>(((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True Present (Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation)))</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Date</td>
<td>Event Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Carter 5/9/80</td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Invade True Present Afghanistan) - True Present The-Careful-</td>
</tr>
<tr>
<td></td>
<td>Warrant-For True Present</td>
</tr>
<tr>
<td></td>
<td>((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True</td>
</tr>
<tr>
<td></td>
<td>Present (Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation))</td>
</tr>
<tr>
<td></td>
<td>((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True</td>
</tr>
<tr>
<td></td>
<td>Present (Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation))</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
<tr>
<td>Carter 8/21/80</td>
<td>Change In Established Belief!</td>
</tr>
<tr>
<td></td>
<td>From: (United-States Enhance True Present United-States-Strategic-Capability)</td>
</tr>
<tr>
<td></td>
<td>To: (United-States Enhance True Past United-States-Strategic-Capability)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Invade True Present Afghanistan)</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Union Invade True Present Afghanistan) - True Present The-Careful-</td>
</tr>
<tr>
<td></td>
<td>Warrant-For True Present</td>
</tr>
<tr>
<td></td>
<td>((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True</td>
</tr>
<tr>
<td></td>
<td>Present (Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation))</td>
</tr>
<tr>
<td></td>
<td>((United-States Cooperate True Hypothetical Moscow-Olympics) Condition True</td>
</tr>
<tr>
<td></td>
<td>Present (Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation))</td>
</tr>
<tr>
<td></td>
<td>(Soviet-Invading-Forces Withdraw True +Goal Sovereign-Nation)</td>
</tr>
<tr>
<td></td>
<td>End Of Walk.</td>
</tr>
</tbody>
</table>
Comments on Simulation Results

Although neither reasoning routine performed with prescience the largest difficulty may not be the routines themselves, but the paucity of information available to them. While at times 22 speeches may have appeared to be a substantial volume to the researcher, this in fact reflects only a very small portion of President Carter’s speeches, press conferences, radio addresses, and interviews both before and during his term in office. And while the speeches are considered to be representative of Carter’s foreign policy beliefs, it is not unreasonable to assume that the inclusion of this material would provide much richer information on Carter’s (public) beliefs and improve the performance of the model. At the same time there are many assumptions about the world which might never be stated, such as which particular countries are members of the United Nations, etc. This type of information may also be very important for the performance of the model. For example had the information existed that the Soviet Union was also a sovereign nation, then the routine could have derived (sovereign-nation invade true present sovereign-nation) for which we may be able to predict Carter’s response. In fact, such as statement was made by Carter on March 17, 1978 (emphasis added):
We've recently completed a major reassessment of our national defense strategy. And out of this process have come some overall principles designed to preserve our national security during the years ahead. We will match, together with, our allies and friends, any threatening power through a combination of military forces, political efforts, and economic programs.

We will not allow any other nation to gain military superiority over us. We shall seek the cooperation of the Soviet Union and other nations in reducing areas of tension.

*We do not desire to intervene militarily in the internal domestic affairs of other countries, nor to aggravate regional conflicts. And we shall oppose intervention by others.*

While assuring our own military capabilities, we shall seek security through dependable, verifiable arms control agreements wherever possible. We shall use our great economic, technological, and diplomatic advantages to defend our interests and to promote American values.

Carter 3/17/78

which produces data statements including the following:

\[
\text{united-states intervene false +goal country}
\]

\[
\text{(country intervene true hypothetical country)}
\]

\[
\text{if-then true present}
\]

\[
\text{united-states resist true hypothetical (country intervene true hypothetical country))}
\]

Missing elements that improve the performance of the simulation are a synonym mapping between \textit{country} and \textit{sovereign-nation}, a \textit{sovereign-nation} designation for \textit{soviet-union} in addition to that for \textit{afghanistan}, and a mapping between \textit{intervene} and \textit{invasive} as a more specific example of \textit{intervene}. The WorldView program incorporates routines to add beliefs to the cognitive maps (add-to-map) to allow for changes such as this and for counterfactual modeling. This facility allows the analyst or researcher to quickly modify the dataset and get the results of simulations without recompiling the entire dataset. Using the add-to-map routine, the modifications described above produce the following output for speeches as early as March of 1978 (Carter 3/17/78):

\[
\text{(soviet-union invade true present afghanistan)}
\]
(soviet-union intervene true present afghanistan)
(soviet-union is-a true present sovereign-nation)
(soviet-nation intervene true present afghanistan)
(afghanistan is-a true present sovereign-nation)
(soviet-nation intervene true present sovereign-nation)
(soviet-nation intervene true present sovereign-nation)
if-then true present
(united-states resist true hypothetical (soviet-nation intervene true present sovereign-nation))
(united-states resist true present (soviet-nation intervene true present sovereign-nation))

End Of Walk.

While this output is not detailed in terms of the resistance offered to intervention in other countries, it does correspond to Carter's general policy including his response to apparently Cuban trained rebels in Zaire in 1978 (Carter 6/7/78). Clearly this result will not startle anyone in its content, but it does demonstrate the success of the modeling enterprise in producing reasonable predictions with a very small dataset.

It was noted in the last chapter that the numerical results were highly sensitive to the synonym list created by the analyst, this example illustrates that this is no less true for the simulation results. Changes in the synonym lists have been shown to result in different generalizations, missed connections between concepts, inappropriate reasoning etc., it is therefore very important that care be taken in the creation and maintenance of synonyms for any simulation.
Overall, the simulations results support the ‘no change’ hypothesis for Carter’s foreign policy problem representation indicated by the results from the five measures. This is further supported by an absence of discrete change detected by the directed-walk routine which keeps track of changes. For the 22 speeches under examination, only two changes in belief were recorded (Table 7), and both were changes from “present” to “past.” No other directly contradictory beliefs were recorded, only additional beliefs. (This is subject to some reservation. Change in belief is defined to the system only in terms of the same subject relationship and object. Other changes may exist, such as contradictory beliefs expressed in terms of two different relationships. For example withdraw can be considered a change from invade.)
CHAPTER V

DISCUSSION AND CONCLUSIONS

The goal of this project has been to investigate the processes that connect prior beliefs and foreign policy behavior by mapping the cognitive terrain of former President Jimmy Carter in the domain of foreign policy, looking at change in this terrain over time, and modeling the dynamic processes of decision making. Although more research can always be undertaken, the project has succeeded in generating intriguing insights into the changes in Carter’s foreign policy beliefs and producing significant progress in specifying the problem representation concept and process.

Change in Carter’s Foreign Policy Problem Representation

It was observed early in this volume that President Carter’s foreign policy changed dramatically over the course of his term in office without corresponding changes in the state or the international system: has a corresponding shift in his problem representation been discovered? The results discussed in the previous chapter are remarkable in one thing, the absence of indicators of change in Carter’s foreign policy problem representation, either gradual or abrupt. Yet, Carter himself expresses profound surprise at Soviet actions and a change in behavior occurred that included a reversal of foreign aid policy and an intensified, although not new, focus on modernizing the armed forces (Rosati 1987/91:117ff) It is not true, however, that there is an absence of change in the measures. All of the measures display substantial change from speech to speech. Except for the apparent confusion in the problem representation immediately following the invasion of
Afghanistan, this suggests that the ability of the measures to characterize Carter’s foreign policy problem representation is swamped by other factors. The topic of the speech and whether it is narrowly focused on a few issues or more sweeping in coverage of many issues affects the structural scores dramatically and masks any trends in the data that might exist.

There are at least four reasons why behavioral change could be produced without producing detectable structural changes; a change in an assumption already existing in the belief system, changes in relative salience of beliefs, change in probabilities attached to beliefs, or the additional of a few new propositions to the belief system.

The first possibility is that there may not have been change in Carter’s beliefs about Soviet intentions but a change in an existing assumption that he could convince the Soviets that cooperation and international restraint was in their best interests with a policy of accommodation. The apparent frustration of this belief over the course of three years, punctuated by the invasion of Afghanistan, may have changed only the premise behind Carter’s policy, but this change had a profound effect throughout the belief system and transformed Carter’s problem representation. For example, if the statement (soviet-union desire true +goal ((and soviet-union united-states) cooperate true +goal international-system)) were a condition for the United States to cooperate with the Soviet Union, then the invasion of Afghanistan would very likely render this statement false, that is (soviet-union desire false present ((and soviet-union united-states) cooperate true +goal international-system)) and thus fail to satisfy a necessary condition for cooperative U.S. behavior. In addition, if the statement (soviet-union desire false hypothetical ((and soviet-union united-states) cooperate true +goal international-system)) were the subject of an if-then statement, the statement (soviet-union desire false present ((and soviet-union united-
states) cooperate true +goal international-system)) would satisfy the if-then and trigger non-cooperative behavior.

The second possibility is that this transformation may only have changed the salience of certain propositions about Soviet actions. If reasoning is guided by salience, as in the directed-walk and choose-policy routines, then a change in the relative salience of some propositions would result in new chains of reasoning and different conclusions. This type of change would also fail to produce structural indications. For example, it is possible that the following two statements could co-exist in the belief-system: (soviet-union desire true present peace) and (soviet-union desire true present power). If a chain of reasoning begins with ‘soviet-union’ and the first statement is more salient than the second, then reasoning will proceed down that chain, i.e., to whatever follows from (soviet-union desire true present peace). The invasion of Afghanistan could easily and dramatically increase the salience of second statement, (soviet-union desire true present power), such that a chain of reasoning beginning with ‘soviet-union’ would proceed to (soviet-union desire true present power) and whatever follows from that.

An identical result could also be found with the third possibility that the change Carter experienced was a change in the probabilities attached to Soviet intentions. If Carter’s estimates of the probabilities of the “bad” Soviet actions foreshadowed in his speeches were low, then the Soviet invasion of Afghanistan would indeed come as a great surprise and cause him to reassess the nature of Soviet leadership and increase his estimate that Soviet intentions were geared to acquiring power and not peace. Although probability information attached to beliefs is not captured by the current coding system, it could produce a change in behavior similar to that resulting from changes in salience without producing discrete changes in particular beliefs and therefore no measurable structural changes. In addition, optimism and pessimism can be phrased in terms of the probabilities
attached to beliefs. If you believe the probabilities of “bad” outcomes are low (< .50), you are an optimist. If you believe them to be high (>= .50), then you are a pessimist and this corresponds to Rosati’s (1987:136-150) characterization of a change in Carter’s outlook from optimism to pessimism during 1979. This is consistent with the data presented here and provides a new insight into Carter’s decision making.

Finally, the ‘no change’ result could also be obtained if the change in behavior were the result of the addition of one or two new propositions. For example, if propositions already exist in the belief system for expansionist states and the appropriate United States response, such as (united-states resist true +goal expansionist-state), but the Soviet Union was not classified as an expansionist state then a new proposition, (soviet-union is-a true present expansionist-state), would add the Soviet Union to the class of expansionist states. This would make all statements applicable to expansionist states applicable to the Soviet Union, for which they may not previously have applied. Assume further that the statement (united-states resist true +goal expansionist-state) has strategies associated with it, i.e., ((united-states resist true +goal expansionist-state) strategy true present (united-states embargo true +goal expansionist-state)), then, by inheritance, the addition of (soviet-union is-a true present expansionist-state) would result in (united-states embargo true +goal soviet-union). Thus, this single proposition could drastically change problem representation created in response to situations involving the Soviet Union while producing only very small structural changes that in most cases would not be statistically significant.

At this point we cannot determine which of these possibilities most closely reflects the changes that occurred in Carter’s problem representation. However, since the simulation results indicate that large scale changes of discrete beliefs did not take place, then one of these four alternatives is likely. In order to detect changes consistent with either, change in probabilities, change in relative salience, change in existing assumptions,
or the addition of new beliefs, further research with the comparative measures is required. Concept comparison, for example, can provide lists of new concepts as they are used by Carter in his speeches and can also be extended to provide lists of new relationships as they appear in the speeches. Furthermore, routines can be designed to compare across the speeches and to detect translocation (the movement of a concept or sub graph from one super ordinate concept to another), differentiation (splitting a concept into parts to preserve consistency), and transcendence (creating a concept super ordinate to existing concepts that incorporates discrepant information but maintains consistency at a higher level), providing substantive information about changes in the belief system. When changes of these types are detected the analyst can systematically run simulations with and without each addition or change to test the sensitivity of the simulation to these changes. This would provide excellent evidence for changes capable of producing behavioral change without producing structural change. Similarly, probability information can be assessed from verbal indicators (Beyth-Marom 1982; Brun and Teigen 1988) and incorporated into the coding and representation systems to provide a means of tracking change in expressed probabilities. These results for Carter’s problem representation suggests that very large and quite dramatic changes in foreign policy behavior can result from quite small and subtle changes in a policy makers beliefs. In addition, only small amounts of highly salient information may transform a policy makers approach to international politics. The key for those seeking to influence policy makers is to identify the particular information which will effectively create desired changes and this appears to require extensive knowledge of the existing belief system and the goal hierarchies it contains.
Problem Representation Process

Broadly speaking the appropriate criteria for evaluating simulations using computational models are outcome validity and process validity (Taber and Timpone forthcoming): Does the model predict the observed behavior or behavior consistent with the observed behavior? Is the process plausible as a model of the actual process? Both of the models used in this project, choose-policy and directed-walk, are very simple and clearly do not capture all of the important features of individual foreign policy decision making. However, each part of both routines is well grounded in psychology and information processing and both do produce behavior that is at least consistent with the observed behavior. In particular, the expected resistance to the invasion produced by the directed-walk routine captures the broad outline of Carter’s policy, although not its details. This successful response by directed-walk to the Soviet invasion provides strong support that President Carter’s thinking can be approximated with a depth-first reasoning routine.

In addition, it became clear during the development of this model that not only must concepts be represented as object in memory, but the relationships between concepts must also be treated as objects for the system to adequately represent beliefs. The difficulty of using spreading activation has also become apparent. As noted in Young (1993b), because spreading activation is indiscriminate and potentially exhaustive, all concepts and relationships in the belief system become incorporated in problem representations generated in response to any situation with at least one concept in common with the belief system. The net result of simulations using spreading activation routines is that all policies contained within the belief system are suggested providing no additional explanatory power than simply listing all options for all events present in the source documents. Spreading activation may correspond to background memory activation processes (i.e., priming) but it is clear from using this approach that more directed explanation oriented routines are more
appropriate for active reasoning. However, explanation based reasoning and spreading activation may occur in combination in cases where there is a great deal of ambiguity or uncertainty in the environment. For example, if an event in the external environment does not correspond to events in memory, or the concepts in the environment generate no clear line of reasoning, then spreading activation be used. Spreading activation would allow the policy maker to consider a larger number of concepts and determine if any match the input from the environment (like free associating to try and determine where you met someone who looks vaguely familiar and whether you should talk to them: do I know this person socially? professionally? a relative?), once a reasonable match is made, then directed processing can occur to generate a coherent line of thought (ah yes, I met her at the International Studies meeting, she was on a panel on post-soviet Russia, her talk was very interesting, she is someone I should talk to). It is also possible that people may reason in different ways - some may proceed from general goals (top down processing) while others may respond more directly to events (down up processing). Both these and other reasoning models can be implemented for comparison.

Finally, it is important to recognize that both choose-policy and directed-walk contain elements, such as goal directed behavior and salience driven reasoning, which are plausible processes that may prove more powerful in combination. In addition, the results from these simulations demonstrate the ability to model the foreign policy reasoning of leaders using the WorldView coding and representation system.
Significance of the Project

Kegley's prescription, that we should map the cognitive terrain of policy actors and place them in dynamic simulations, is not new in foreign policy analysis, but it does difficult to achieve. Within Political Science beliefs have become objects to be attributed explanatory power without systematically connecting these beliefs to behavior in the process models that are necessary to establish a causal connection (For a recent example see Blum 1994). At the same time cognitive theories are used without adequate operationalization which reduces them to stories that we tell about past events. (For an example see Larson 1985.) Part of this problem is that many of the psychologists who develop most of these theories are not directly interested in the questions that (at least some) researchers in the cognitively oriented research program in foreign policy are interested in: why did this particular person act in this particular way and how can we know how this person will act in the future in response to specified events? (While this may be the ultimate goal of some psychologists, it is a long term goal and the typical large N experimental methodology does not lend itself to these questions.) This difference means that political scientists may find psychological theories under specified for their purposes and therefore political scientists must provide the necessary tools to fit these theories to our purposes and contexts rather than simply borrowing terminology and concepts to improve our story telling. Although "beliefs" have become accepted as a source of explanation for foreign policy behavior, they are difficult to systematically operationalize and build process models around. The importance of the problem representation construct is that coupled with "new" computer techniques it can provide a significant contribution to the study of foreign policy decision making and put psychological theory in motion in political contexts.

Thus, the significance of this project lies not so much in the insight gained into Carter's foreign policy decision making, but rather in the more general insights into the
processes that connect prior beliefs and behavior that it has generated and the tools it provides to continue research into those processes. A great deal of effort has gone toward producing a content analysis coding system with considerable expressiveness that is generalizable and allows for the systematic, reproducible and explicit mapping of beliefs. Although the coding relationships were chosen with foreign policy analysis in mind, they have been kept deliberately broad and each of the relationships is considered to be independent and imposes no contingent relationships on the others. The coding system, in itself is a notable achievement, and an advance over previous operationalizations which holds great potential for answering difficult questions in Political Science as Charles Kegley has suggested.

In addition, a system has been developed for the representation and manipulation of these beliefs that provides new levels of flexibility of analysis and opportunities for more systematic research using the formal representation of a computational model. The structure of this model is also generalizable and has the capacity to worked with any set of defined relationships. The model has been developed with careful reference to psychological theory and provides an excellent platform for theory building to assist political science in answering the difficult questions posed by Snyder, Bruck, and Sapin (1954/62) and echoed by Kegley (1994). This approach corresponds to Dodd’s (1993:52) call for “formal interpretivism” in political inquiry and increases our ability to respond to the “empirical challenge” of the cognitive perspective:

> to devise methods that have a sound theoretical base for inferring the values that give our cognitive frames and games their fundamental explanatory power.

Herrmann 1988:175

The content analysis and modeling systems in combination also provide an excellent base for a broad range of future research beyond that detailed earlier.
Future Research

One area of research that has only briefly been touched on here is research on the effects of personality or individual differences on foreign policy decision making. Research in foreign policy based on individual differences (Winter & Stewart 1977; Walker 1983; Weintraub 1986; Winter & Carlson 1988; Hermann 1980, 1988; Barber 1977; Winter et al. 1991; Hermann and Preston 1994) suggests that there are additional factors independent of cognitive content and processing that may produce large differences in decision making outputs. These factors include: affect associated with particular issues, individual motivation or need-based behavior (as distinct from goal based behavior), reasoning style, management style, tolerance for uncertainty, and a number of other individual traits. For a comprehensive understanding of individual foreign policy decision making all of these need to be accounted for in an integrated theory. Yet, however successful we may become at modeling individual reasoning, a great potential for future research lies in the recognition that most decisions are made in a group context. However, when we move from the individual level to the group level the reasoning process changes, as group members are required to combine their beliefs and representations into a negotiated belief system (Walsh, Henderson, & Deighton 1988). And it is here that the management style of the group leader and patterns of interaction can become highly influential, for example, as Walsh, Henderson and Deighton (1988) note, “if one person in a group of four completely dominates the decision making process, the schemata and views of the other three members effectively do not exist.” In the group decision making process, individual differences such as style can be considered to be a mediating variable between the information presented within the group and the individual’s belief system.

Future research stemming from this project will be directed at refining the model of individual decision making and also moving toward models of group decision making
processes. In particular, additional research will be performed using the data already collected for President Carter to determine if any of the types of undetected change in his foreign policy problem representation discussed at the beginning of this chapter can be detected using refined comparative measures such as concept comparison. Research on the Carter Administration will also be expanded to include Carter’s top advisers, Vance and Brzezinski, to investigate their influence on Carter’s problem representation. The implicit assumption in this study has been that the source of change in Carter’s foreign policy behavior and problem representation has been external, that is the international environment, little attention has been paid to the hypothesis that this change was the result of a competition between his principle advisers. Nathan and Oliver (1981) for example focus on the differences between Vance and Brzezinski as the source of the “waffle” in policy observed by Ambrose (1990). Examining the positions of Vance, Brzezinski, and Carter with the comparative measures (incongruence, concept comparison, and transformation cost) would allow us to track how closely Carter’s position resembled that of either adviser and help to differentiate sources of beliefs change internal to the White House and those in the external environment.

Additional research is also planned to investigate the foreign policy problem representation of President Clinton. Using President Clinton as a subject will enable predictions and tracking to be made in real time, a more powerful test of the model than post-diction and an opportunity to assess the generalizability of the reasoning model. Finally a project is already underway with two colleagues to combine work on individual differences, specifically foreign policy orientations and management style, with problem representation research with the goal of integrating these three theories of decision making in a small group context. This will provide a solid foundation for modeling the policy behavior of small groups where group dynamics, communication strategies, and unevenly
distributed information further complicate the decision making process. Once small group interactions can be modeled, Carter's interactions with his key advisers in response to external events can be added to the analysis. This integrated model will further clarify the processes which drove belief and policy change in the Carter Administration.
APPENDIX A

WORLDVIEW CONTENT ANALYSIS INSTRUCTIONS

In broad terms, the content analysis system seeks to identify beliefs that take the familiar subject relationship object format often found in English and used in creating causal cognitive maps (Axelrod 1976), for example ‘Cuba is-a communist-country.’ The types of relationships and concepts that make up the content analysis coding system were derived from both Cognitive Psychology and the study of Foreign Policy, and while the resulting coding system has parallels with Axelrod’s (1976) coding system for causal beliefs, it allows for different types of relationships between concepts, beyond causal relationships, and captures much more information from the text, including goals and logical relationships between concepts.

The human coded content analysis system is designed to produce data items that can be incorporated into the subject - relationship - object data structure of the WorldView model with as little interpretation as possible by the coder. As such each item must be composed of five parts: the subject concept, a relationship between the concepts, a relationship-modifier, a truth-value, and a object concept. It is the coders task to transform free text into data statements ready for processing. This involves creating a 5 part coding of the following form:

\[ \text{subject relationship truth-value relationship-modifier object} \]

\[ ^{20} \text{In the content analysis system human coders translate the free text into data statements which are then compiled into cognitive maps by the automated portion of the system. As such it might be described as human coded with machine assisted analysis. This is in contrast to other forms of content analysis such as the KEDS system (Schrodt 1991) which has the potential to be fully machine coded with machine assisted analysis.} \]
which is reduced in the system to a three part relationship.

subject relationship object

with the relationship-modifier and truth-value information contained within the structure of the relationship.

The initial unit of analysis for coding purposes is the sentence, however, this coding unit is expanded as necessary to allow for the replacement of pronouns and provide the coder with an opportunity to clarify ambiguous references. In the extreme case the coding unit may span the entire text.

Researchers are encouraged to code on-screen using the full text, and to leave the original text, commented out, in the coded document. This allows for an immediate identification of the source of a coding for resolving inter-coder conflicts, and for the revision of documents if the coding system is modified.

Material To Be Coded

Only policy items and beliefs about the operation of the world are to be coded.

Material Not Coded

Preambles & comments

Initial remarks, such as preambles and comments addressed specifically to the immediate audience of the speech, which do not have policy relevance or do not contain policy items or beliefs about the operation of the world are not coded, nor are remarks about the location of the speech.

For myself and for our Nation, I want to thank my Predecessor for all he has done to heal our land.
In this outward and physical ceremony, we attest once again to the inner and spiritual strength of our Nation. As my high school teacher, Miss Julia Coleman,
used to say, "We must adjust to changing times and still hold to unchanging principles."

Here before me is the Bible used in the inauguration of our first President, in 1789, and I have just taken the oath of office on the Bible my mother gave me just a few years ago, opened to a timeless admonition from the ancient prophet Micah: "He hath showed thee, o man, what is good; and what doth the Lord require of thee, but to do justly, and to love mercy, and to walk humbly with thy God." (Micah 6:8)

This inauguration ceremony marks a new beginning, a new dedication within our government, and a new spirit among us all. A President may sense and proclaim that new spirit, but only a people can provide it.

References to the past

References to particular points in the past are not coded unless they are explicitly linked to the world today. On the other hand statements about relationships which existed in the past may be coded, for further clarification see Relationship Modifiers below.

Two centuries ago,

We recall in special times when we have stood briefly, but magnificently, united.

Goals that refer only to the occasion of the speech.

In addition to comments about the location of the speech or the nature of the occasion (graduation, trade conference, etc.), goals which refer only to the immediate time frame of the speech are not coded, including outlines of the speech.

I would like to add a word about private investment.

I want to speak to you today about the strands that connect our action overseas with our essential character as a nation.
Subject Concepts & Object Concepts

Concept Modifiers

Modifiers should be used as part of concepts as long as they serve to uniquely identify the concept, otherwise the appropriate relationship should be used. For example where blue fox is the name of some object then the concept is blue-fox, where blue refers to the color of the object then the concept is fox attribute present true blue. In any case where the concept has been encountered and coded previously without the modifiers as part of the concept, then the same identifier should be used again. Leading articles such as “the” or “a” should be dropped from concepts. Examples:

the United States Mission in Vietnam
united-states-mission-in-vietnam
USS Hood, currently in Manila
uss-hood location true present manila
But the bold and brilliant dream which excited the founders of this Nation still awaits its consummation.
bold-and-brilliant-dream-which-excited-the-founders-of-this-nation attribute false present consummated

Note: In this example and throughout coding, subjects or objects which are identified by more than one word are coded with the words connected by dashes, i.e., united-states-mission-in-vietnam. The identification of the correct subject and object concepts will also be enhanced if text in the passive voice is changed into active voice for coding.
Pronoun replacement

Whenever possible, pronouns and references which would be vague or ambiguous out of context should be replaced with a more specific phrase from the text. This may require looking at the surrounding sentences to identify the referent. In most cases use of "we" is taken to refer to the speaker's state (national political unit) unless otherwise indicated. When pronouns are replaced, a commented out indication of the replacement should be entered into the coded document. Example:

*We desire a freeze on further modernization and production of weapons.*

*united-states* stop true +goal modernization-and-production-of-weapons

Compound Concepts

In many cases, either the subject or object concept is compound, i.e., the United States and the Soviet Union. Wherever possible, the compound subject should be dis-aggregated and a separate data statement created for each part of the compound concept. Where the text indicates that the compound concept cannot be dis-aggregated, i.e., an action that must be joint to make sense, then the *and* conjunction should be used. When the *and* conjunction is used it appears within parenthesis at the beginning of the list of concepts included in the compound concept. Parentheses are also used to enclosed dependent statements in compound statements. Examples:

*we've moved to engage the Soviet Union in a joint effort to halt the strategic arms race.*

(and *united-states* soviet-union) stop true +goal strategic-arms-race

*Therefore, we expect Israel and her neighbors to continue to be bound by United Nations Resolutions 242 and 338.*

*israel* honor true future *united-nations-resolutions-242-and-338*

*israel's-neighbors* honor true future *united-nations-resolutions-242-and-338*
*Null*

In some cases an object or subject concept is not specified in the current sentence and cannot be determined by reference to surrounding text, in these cases the unspecified concept should replaced with "*null*".

**Relationships**

There are many different relationships available to the coder (see below). Each of the relationships is considered to be independent and imposes no contingent relationships on the others, although some appear only in combination with others. Items coded using the *normative* relationship for example are not required to be consistent with items coded using the *goal* relationship, however, the *strategy* relationship does connect goal statements with means statements. All of these relations conform to the same format.

In choosing the relationships below, care has been taken to preserve aspects thought to be crucial for modeling foreign policy reasoning, based on theoretical accounts of reasoning in both Psychology and in Political Science, and necessary to capture the features of problem representations (goals, strategies, expectations, conditions). And while the coding system attempts to be as general as possible, and these specific relations were chosen with Foreign Policy analysis in mind, the structure of the simulation itself is general enough to work with any set of defined relations. The first group of relationships (through *warrant-for*) refer more particularly to the description of problem representations. The remainder of the relationships (beginning with *accept*) can be considered to be actions of actors and were developed with that consideration and with reference to the KEDS (Schrodt 1991) event coding. However, the use of these relationships is not restricted to actors.
Comparisons between two concepts or statements that indicate any form of equivalence relationship, including mathematical and semantic are coded with =. However, = should not be used to indicate synonymous concepts, instead these concepts should be added to the synonym file. Example

;>; We are confident that democratic methods are the most effective,

democratic-methods = true present most-effective-methods

<

Comparisons between two concepts or statements that indicate an inequality relationship of "less than" are coded using <.

>

Comparisons between two concepts or statements that indicate an inequality relationship of "greater than" are coded using >.

+

Relationships that are coded + indicate that the subject is the sole or a contributing positive cause of the object., i.e., the subject is the cause of an increase in the quantity/value of the object. Example:

But any of these incidents-all of them add up to clear violations of international law. And I think they do raise tensions; they clearly do.

clear-violations-of-international-law + true present tensions

Exception:
give is a special case because it can produce two different codings, either:

X cause true present (Y possess true present Z)

where X is an actor and the causation can be considered to be discrete or
X + true present Y

where X has a continuous causal relationship with Y.

*It is that unique self-definition which has given us an exceptional appeal.*

unique-self-definition + true past (united-states attribute true present an-exceptional-appeal)

- is the symmetrical case of + to increment. In this case, the subject is the cause of a decrease in the quantity/value of the object. Example:

*This comment out of Iraq attributed to Saddam Hussein, the President. ... And I don't think it helps peace in the Middle East.*

comment-out-of-iraq-attributed-to-saddam-hussein - true present peace-in-the-Middle-East

*Attribute*

An *attribute* relationship indicates that the object concept, usually an adjective, is an attribute or quality of the subject concept, such as color, size, magnitude etc. The object of an *attribute* relationship must be a quality that cannot stand apart from the subject, i.e., intangible aspects of the subject. Example:

I would simply say the *status quo is unacceptable*

status-quo attribute false present acceptable

Notice here that the truth-value is used to convey the meaning of unacceptable by negating acceptable, this is the preferred coding procedure, and is used in order to minimize the proliferation of concepts. In addition giving support or being supportive is considered to be an action not an attribute of an object concept.
Know

A know relationship indicates that the subject, an actor other than the author of the text, has the knowledge contained within the object, which is a complete triplet. Know is only used to indicate the knowledge of an actor other than the speaker, the speaker’s declarations of his own or his nation’s knowledge are coded as simple statements. Care should be taken because the speaker must agree with the dependent statement which constitutes the object of the know relationship and the truth-value of know should be adjusted accordingly. Example:

The leaders of Latin America understand that isolation hinders economic growth.

leaders-of-latin-Ameri cia know true present (isolation - present true economic-growth)

Is-a

Is-a indicates that the subject is a member of the class of objects identified by the object concept or is equivalent to the object. Is-a is only used for classes and objects, not qualities or attributes. Examples:

our Nation’s birth was a milestone in the long quest for freedom.

united-states-birth is-a true past a-milestone-in-the-long-quest-for-freedom

Ours was the first society openly to define itself in terms of both spirituality and human liberty.

united-states attribute true present first-society-openly-to-define-itself-in-terms-of-both-spiritualit y-and-human-liberty

Location

A location relationship indicates that the subject is at the place identified by the object. A location relationship is not coded when the location forms part of the identification of the concept. In addition the location relationship is often the object of a cause relationship (i.e., a move action). Example:
the United States Mission in Vietnam

united-states-mission-in-vietnam

USS Hood, currently in Manila

uss-hood location true present manila

If-then

An if-then relationship indicates that the object is necessary for the subject to be true or to be put into effect if it is a strategy concept. The if-then relationship captures sufficient conditions, while the condition relationship (next below) captures necessary conditions, a combination of the two handles necessary and sufficient conditions. If-then must have dependent relationships as both subject and object. Example:

If the soviet union ratifies SALT II, then we will also ratify it.

(soviet-union ratify possible future salt-ii)
if-then true present
(united-states ratify possible future salt-ii)

Condition

A noted above, the condition relationship is used to code expression of a necessary condition for some statement to be true. Condition relationships must have dependent relationships as both subject and object. Examples:

Our Nation can be strong abroad only if it is strong at home.

(united-states attribute possible present strong-abroad)
condition true present
(united-states attribute possible present strong-at-home)

While our ultimate goal is for all nuclear powers to end testing, we do not regard this as a prerequisite for the suspension of tests by the two principal nuclear powers, the Soviet Union and the United States

((and united-states soviet-union) stop possible future nuclear-testing)
condition false present
(nuclear-powers stop true +goal nuclear-testing)
Part-Of

A part-of relationship indicates that the subject is a component or integral part of the object. In cases where a concept is said to be comprised of several other concepts, then each component becomes the subject of a separate part-of relationship. Example:

First, we have reaffirmed America's commitment to human rights as a fundamental tenet of our foreign policy.

united-states assert true past (human-rights part-of true present united-states-foreign-policy)

Strategy

A strategy relationship indicates that the object, is a means to the satisfaction of the subject. The subject of strategy is always a dependent +goal relationship. The object is also a dependent relationship, often a +goal and is an implied means to satisfy the goal. Example:

To slow the costly buildup of conventional arms, we are seeking global policies of restraint.

(United-states reduce true +goal costly-buildup-of-conventional-arms)
strategy true present
(global-policies-of-restraint-in-conventional-arms attribute true +goal exists)

Warrant-for

The warrant-for relationship is used to indicate that the subject of warrant-for is an example of, justification for, or supporting statement for the object of warrant-for. Both the subject and object of warrant-for relationships are dependent relationships. Warrant-for relationships are indicated by the relative position of the sentences, or by connectors such as “for” and “so.” Example:

We have our own shortcomings and faults, and we should strive constantly and with courage to make sure that we are legitimately proud of what we have.

(United-states attribute true present shortcomings-and-faults)
warrant-for true present
(United-states feel true + goal legitimately-proud-of-what-we-have)

The economies of most Latin American nations have been developing rapidly, although, of course, at different rates. Some have an impressive rate of growth.

(economies-of-most-Latin-American-nations attribute partial present (economies-of-latin-america attribute true present impressive-rate-of-growth))
warrant-for true present
(economies-of-most-Latin-American-nations attribute true present developing-rapidly-at-different-rates)

Accept

The accept relationship is used to code text that indicates that an actor, the subject, agrees to a treaty, plan of action, terms of surrender, etc. Example:

we agreed on joint efforts to reinforce and to modernize our common defense.

nato-members accept true past joint-efforts-to-reinforce-and-to-modernize-the-democracies-common-defense

Allow

The allow relationship is used to indicate that the subject, an actor, will not block an other actors action or try to prevent a state of affairs. The allow relationship is also used with a truth-value of false to code statements where an actor(s) is opposed to or obstructs another actor or action. Example:

And we are confident of the good sense of America people, and so we let them share in the process of making foreign policy decisions.

(america-people attribute true present good-sense)
warrant-for true present
(United-states allow true present (america-people cooperate true present process-of-making-foreign-policy-decisions))
Assert

The *assert* relationship is used to indicate agreement with a statement, or a promise by an actor. *Assert* is usually not necessary when the author of the speech is the subject and the sense of *assert* is proclaim promise, or affirm.

*Even more important, all of us reaffirmed our basic optimism in the future of the democratic system.*

nato-members assert true past (nato-members feel true present basic-optimism-in-the-future-of-the-democratic-system)

Assist

The *assist* relationship is used to code various types of help actions that are not covered by more specific relationships. Example:

*The United States will assist the Republic of South Africa*

united-states assist true future republic-of-south-africa

Attack

The *attack* relationship is used to code military attacks of an actor(s) against another actor(s). Example:

*Iraq attacked Kuwait on August 2nd 1990.*

iraq attack true past Kuwait

Cause

The *cause* relationship is used to code all statements of initiation or beginning, and also to code give/donate actions. Example:

*At the recent summit, we set in motion an international effort ....*

united-states cause true past international-effort-...
Close

The close relationship is designed for use where open could make sense, but not cause/stop or enhance/reduce. Example:

Argentina has closed its markets.
argentina close true past markets

Compete

The compete relationship always has an and conjunction as its subject, and the object of the relationship should be the object or arena of competition. If no object or arena of competition is identified then the *null* concept should be used.

Concern

A concern relationship indicates that the object concept is a concern for the subject (again an actor), or is a cause of concern or worry. Example:

We are concerned about the Iraqi invasion of Kuwait
united-states concern true present (iraq cause true past (iraqi-troops location true present kuwait))

Condemn

The condemn relationship is used to code statements of disapproval, or condemnation. Example:

We protest human rights abuses everywhere.
united-states protest true present human-rights-abuses

Confront

The confront relationship is used to code statements indicating an intent to “deal with” or “face up to” a situation or actor. Example:

we must respond to the new reality of a politically awakening world.
Consider

The consider relationship is used in all cases where thought or planning is indicated. In addition to “lose sight of” something is to not consider it. Example:

*We've already completed a comprehensive review of our own policy on arms transfers.*

(consider true past united-states-policy-on-arms-transfers)

Consult

The consult relationship is used in cases where two or more actors intend or are currently talking about an issue, but are not negotiating to reach an agreement. The subject of discuss is an *and* conjunction as discussed in Compound Concepts, the object is the concept under discussion. If no object or subject of discussion can be identified then the *null* concept should be used. Example:

*However, some of our own global policies are of particular interest to other American States.*

*When major decisions are made in these areas, we will consult with you.*

(consult true future united-states-global-policies-of-particular-interest-to-other-american-states)

Control

The control relationship is used when an actor does not possess the object but does control or manipulate it, also used where the subject dominates the object. Control is not used in the sense of “limit,” but rather to “dominate” or “direct.”
Cooperate

In some ways the cooperate relationship is the inverse of the compete relationship, and also often takes an and conjunction as its subject. The object is the arena of cooperation, if no arena of cooperation can be specified, then the *null* concept is used. Where the subject is simple then cooperate is also used to code participation. Cooperate is not used if the arena of cooperation is a specific action, in which case the applicable relationship is used.

We wish to cooperate closely with the creative Chinese people on the problems that confront all mankind.

(and united-states peoples-republic-of-china) cooperate true +goal problems-that-confront-all-mankind

The Western democracies the OPEC nations, and the developed Communist countries can cooperate through existing international institutions.

western-democracies cooperate possible present international-institutions
OPEC-nations cooperate possible present international-institutions
developed-communists-nations cooperate possible present international-institutions

Decide

The decide relationship is used to code decisions that have alternatives. However, if the subject, an actor, has decided on an alternative, and is expressing that decision, then assert should be used. In other cases, the consider relationship may be most appropriate. The object of a decide relationship will often be an or conjunction. For the most part, decide will be used with the future relationship modifier.

However, some of our own global policies are of particular interest to other American States.
When major decisions are made in these areas, we will consult with you.

(United-states decide true future united-states-global-policies-of-particular-interest-to-other-american-states)
if-then true present
Defend

The *defend* relationship is used to code statements where the subject, an actor, seeks to protect the object from an unspecified threat(s).

*We will defend Israel*

united-states defend true future israel

Delay

The *delay* relationship is used to code statements where the subject is postponing some event or action.

Demonstrate

The *demonstrate* coding is used to code statements where the subject seeks to prove or show the object which is usually a dependent relationship.

Enforce

The *enforce* relationship is used where an actor will enforce or guarantee some agreement or behavior. Also used to code “impose” or “coerce” actions.

*We hope to persuade the Soviet Union that one country cannot impose its system of society upon another.*

soviet-union know true +goal (one-country enforce impossible present system-of-society)

Enhance

The *enhance* relationship is used to cover a wide range of statements where the subject in some way improves, increases, intensifies, or speeds up the object.

*We seek to encourage international travel.*
united-states enhance true +goal international-travel

Feel

Any statement of emotion; some object causes an actor to feel the emotion.

I am afraid of bears

bears + true present (michael feel possible present fear)

Honor

The honor relationship is used to capture promises of obedience to rules or keeping agreements, and stipulations, or honoring obligations.

Therefore, we expect Israel and her neighbors to continue to be bound by United Nations Resolutions 242 and 338.

israel honor true future united-nations-resolutions-242-and-338

israels-neighbors honor true future united-nations-resolutions-242-and-338

Ignore

The relationship ignore is used to reflect a deliberate and conscious act.

This may be the most propitious time for a genuine settlement since the beginning of the Arab-Israeli conflict almost 30 years ago. To let this opportunity pass could mean disaster for the Middle East.

(united-states ignore true hypothetical most-propitious-time-for-a-genuine-settlement-since-the-beginning-of-the-arab-israel-conflict) - true present middle-east

Influence

The influence relationship is used to code statements where the subject of the relationship exerts some influence over the object, but does not control or dominate the object.
Our own policy will not be affected by changes in leadership in any of the countries in the Middle East.


Intervene

Intervene relationships are used when one actor attempts to change the outcome of situation. The object of intervene is the situation or location of the intervention.

Invade

Invade is used to code actions where the military forces of one country enter into the territory of another uninvited.

soviet-union invade true present afghanistan

Lead

The lead relationship is used when an actor takes charge or some process, group, or joint action, which is the object of the relationship.

We can no longer expect that the other 150 nations will follow the dictates of the powerful, but we must continue confidently our efforts to inspire, to persuade, and to lead.

(other- 150-nations honor false future the-dictates-of-the-powerful) warrant-for true present (united-states lead true +goal *null*)

Limit

The limit relationship is used to code instances where the subject, an actor, is minimizing, curtailing or restricting the object.
**Maintain**

The *maintain* relationship is used where an actor the subject is acting to stabilize the object, i.e., to keep something at the same level. Where the actor will continue with a specific action; then either the appropriate relationship is used or the *perform* relationship is used.

**Meet**

Meet is used to code face to face meetings between two actors or groups of actors.

**Monitor**

The *monitor* relationship is used where an actor or group of actors is actively watching a situation or actor(s).

**Negotiate**

The *negotiate* relationship has an *and* conjunction as its subject, and the object is the arena of negotiation. Example:

*Through wide-ranging consultation with leaders of the countries involved-Israel, Syria, Jordan, and Egypt -we have found some areas of agreement and some movement toward consensus.*

*(and united-states leaders-of-countries-involved-in-middle-east) negotiate true past peace-in-the-middle-east + true present areas-of-agreement*

**Open**

The *open* relationship is the complement to the *close* relationship, and is used only where *enhance* does not apply, such as “open their markets” most in most other cases *enhance* should be used.
Order

The order relationship is used where one actor instructs another actor, and the action to be taken is the object of the order relationship.

Organize

The organize relationship is used to code statements referring to arranging, or mobilizing events or objects, but should not be used where cause could be substituted.

Perform

The perform relationship is used to code statements where an actor(s) takes unspecified actions, such as “appropriate steps.”

Possess

Possess indicates ownership of the object by the subject. The subject of possess must be an actor, and the object must be capable of an existence apart front the subject, i.e., the USS Hood. Example:

France has vessels

France possess true present vessels

Prefer

Relationships between concepts in the texts that are coded as prefer indicate an object desired by the subject (always an actor). The object is always a simple concept and cannot be another data statement. In cases where the object is not a simple concept then a normative relationship modifier should be used. If a comparison object is available then > or < may be a better choice. Example:
I prefer vanilla ice cream

Jimmy-Carter prefer true present vanilla-ice-cream

Propose

The *propose* relationship is used to code statements where offers or invitations are made.

Purchase

The amount of the purchase cannot be coded at present.

Ratify

The *ratify* relationship refers specifically to a diplomatic action, i.e., the formal legalization of a treaty by a legislative body.

Reduce

The *reduce* relationship is the inverse of the *enhance* relationship and is used to code relationships where the subject, an actor, acts to decrease as opposed to just limit the amount/value of the object.

*And fifth, we are attempting to reduce the danger of nuclear proliferation.*

united-states reduce true +goal danger-of-nuclear-proliferation

Request

The *request* relationship is used to code statements where one actor asks something of another actor, usually the object of *request* is another relationship with a *hypothetical* modifier.
The *restore* relationship is used to code statements where an actor(s) acts to return some object to its previous level/value.

*We want to reinvigorate relations with Japan.*

united-states restore true +goal ((and united-states japan) share true +goal diplomatic-relations)

*Separate*

The object of *separate* is always an *and* conjunction.

*We can no longer separate the traditional issues of war and peace from the new global questions of justice, equity, and human rights.*


*Share*

The *share* relationship is used to code a variety of relationships between actors, in particular diplomatic relations. Share often has an and conjunction as its subject and some arena of sharing as its object. Example:

*We see the American and Chinese relationship as a central element of our global policy, and China as a key force for global peace.*

((united-states peoples-republic-of-china) share true future diplomatic-relations) part-of true present united-states-global-policy

peoples-republic-of-china is-a true present a-key-force-for-global-peace

*Sign*

The *sign* relationship refers to a particular diplomatic/legal action and is used to code the signing of treaties or agreements by an actor(s). Sign can take an *and* conjunction as its subject, but should be avoided unless absolutely necessary.
Stop

The stop relationship is the complement of the cause relationship and is used when an actor(s) ends, suspends, or vetoes the object.

This strategic arms race is not only dangerous, it's morally deplorable. We must put an end to it.

united-states stop true +goal strategic-arms-race

Support

The support relationship is used to code expression of encouragement or support for an actor or other object. The subject of support is an actor(s) Support should not be confused with a normative relationship modifier. When multiple actors support an object, each actor is the subject of a separate data statement for further clarification see Compound Statements below. Example:

We will continue to promote a settlement in the Middle East.

united-states support true present settlement-in-the-middle-east

Threaten

Threaten should only be used to code statements where the subject places the object at risk. Where the threat is an explicit action or condition, then the assert or if-then relationships should be used. Care should be taken to code inanimate concepts with - rather than threaten.
Withdraw

Use

The use relationship is used to code statements where an actor(s) employs some object, often as the subject of a strategy relationship. Also used to code “exploit” or “take advantage of”.

Our Nation stands for more than financial prosperity.
This does not mean that we can conduct our foreign policy by rigid moral maxims.

(United-states attribute true present stands-for-more-than-financial-prosperity)
(Warrant-for false present
(United-states use possible present rigid-moral-maxims)

Verify

The verify relationship is used when an actor is demonstrating or proving something to itself.

Visit

The visit relationship is used to code actions where one actor travels to meet another actor or to be at some location.

Vote-On

Very straightforward, the vote-on relationship is used to code votes. The subject of the relationship is an actor(s) and the object is the item to be voted on.

Yield-To

The yield-to relationship is used to code surrender or submission of the subject, an actor, to an other actor or process.
Truth-values

The negation of relationships occurs with some frequency in foreign policy texts, and it is important that these are captured in the coding system. In order to capture these negations with the greatest semantic fidelity, and for the ease of computation, a truth value is coded for each relationship, and can have a value of either True, False, Partial, possible, or impossible.

True

The true truth-value indicates that the statement is true for both subject and object, and if either of these is a class of instances, then the statement is true of all instances of the class(es).

False

The false truth-value indicates that the statement is not true for both subject and object, and if either of these is a class of instances, then the statement is not true of all instances of the class(es).

Partial

The partial truth-value is a qualified indication of truth, and is used when either the subject or object is a class of instances, but the statement is not true of all instances of the class(es).

The economies of most Latin American nations have been developing rapidly, although, of course, at different rates. Some have an impressive rate of growth.

(economies-of-most-Latin-American-nations attribute partial present (economies-of-latin-america attribute true present impressive-rate-of-growth)) warrant-for true present
(economies-of-most-Latin-American-nations attribute true present developing-rapidly-at-different-rates)
Possible

A possible truth-value indicates that the statement indicated by the relationship could become true at some time but it is not necessarily expected to become true, including statements of capabilities. For statements that are expected to become true, i.e., planned actions, then the future relationship modifier should be used.

Example:

*We have the ability to stop ship carrying contraband.*

United-States stop possible future (ship perform possible future carry-contraband)

Impossible

An impossible truth-value indicates that the statement indicated by the relationship cannot become true. Example:

*No one nation by itself can build a world which reflects all these fine values.*

one-nation build impossible present world-which-reflects-the-founding-principles-of-the-united-nations

Relationship Modifiers

The WorldView system recognizes six relationship modifiers, *past, present, future, +goal, hypothetical,* and *normative* which are used to code the circumstances under which the data statement indicated by the relationship and truth-value are true.

Past

A past relationship modifier indicates that the relationship referred to is in the past. If the relationship is an action, then the action is now complete. Example:

*We have moved forces to Saudi Arabia*

united-states cause true past (united-states-forces location true present saudi-arabia)
In our recent meetings in London, we agreed to widen our economic cooperation.

nato-members assert true past (nato-members enhance true future economic-cooperation)

Present

A present relationship modifier indicates that the subject, an actor, is performing some action, the object, that is ongoing, or that the indicated relationship is currently true, partially true, or false. Examples:

We are working closely with our European friends on the forthcoming Review Conference on Security and Cooperation in Europe.

(and united-states european-friends) cooperate-on true present Review-Conference-on-security-and-cooperation-in-europe

Future

A future relationship modifier indicates that the subject, an actor, will perform some indicated action, or the indicated relationship will be true, partially true, or false.

The United States will support the efforts of our friends to strengthen the democratic institutions in Europe, and particularly in Portugal and Spain.


+Goal

A +goal relationship indicates that the statement indicated by the relationship and the truth-value is a statement that the author of the text wants to become true. The +goal relationship modifier, combined with the strategy relationship, provides a means for capturing goal hierarchies present in the text, as +goal relationships can be both the subject and object of strategy relationships. Example:

We must once again have full faith in our country-and in one another.
people-of-the-united-states feel true +goal full-faith-in-our-country-and-in-one-another

Hypothetical

A hypothetical relationship modifier indicates that the statement indicated by the relationship and the truth-value is a statement that may or may not become true.

Normative

The normative relationship modifier indicates that the relationship is normatively valued by the author of the text. Care should be taken in distinguishing goal statements from normative statements, goals are actively sought, and the actor may be taking steps to achieve them, normative statements are at the level of “it would be nice if...” Example:

It is a new world-but America should not fear it.

new-world + false normative (america feel possible present fear)

Conjunctions

The WorldView system recognizes two conjunctions, and and or, which are used with specific types of compound concepts within a set of parentheses.

And

The and conjunction is used when two or more actors are engaged in joint action that cannot be restated as a set of single actions, for further clarification see Compound Concepts above.

Or

The or conjunction is used primarily to indicate a set of alternatives to a decision.
Compound Statements

There are two general types of compound statements that are encountered in policy speeches, those with a compound subject or object, and those with relationships as either subject or object, or both. Statements with a compound subject or object should be reduced to a set of statements each with a simple subject/object. Statements with relationships as either subject or object, or both should be coded as is, with the dependent statement(s) in parentheses. Example:

*The independence of Iran is also our own vital interest.*

(iran attribute true present independent) is-a true present united-states-vital-interest
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>=</td>
<td>equal to&lt;br&gt;means&lt;br&gt;is</td>
</tr>
<tr>
<td>&lt;</td>
<td>less than&lt;br&gt;not as good as</td>
</tr>
<tr>
<td>&gt;</td>
<td>greater than&lt;br&gt;better than</td>
</tr>
<tr>
<td>+</td>
<td>adds to&lt;br&gt;further&lt;br&gt;magnify&lt;br&gt;make&lt;br&gt;more constructive&lt;br&gt;move forward&lt;br&gt;progress&lt;br&gt;promotes&lt;br&gt;raise&lt;br&gt;strengthen&lt;br&gt;increase</td>
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<tr>
<td>-</td>
<td>contain&lt;br&gt;doesn’t help&lt;br&gt;hinders&lt;br&gt;removes from&lt;br&gt;retards&lt;br&gt;decrease&lt;br&gt;restrain</td>
</tr>
<tr>
<td>accept</td>
<td>agree&lt;br&gt;accept&lt;br&gt;not dispute</td>
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<tr>
<td>allow</td>
<td>permit&lt;br&gt;tolerate&lt;br&gt;not&lt;br&gt;resist&lt;br&gt;obstruct&lt;br&gt;oppose&lt;br&gt;repel&lt;br&gt;resist&lt;br&gt;stand firm against</td>
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<td>assert</td>
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<td><strong>assist</strong></td>
<td>help</td>
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<td>-----------</td>
<td>-----</td>
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<tr>
<td><strong>attack</strong></td>
<td>attack, launch attack, persecute</td>
</tr>
<tr>
<td><strong>attribute</strong> (subject is usually an adjective)</td>
<td>be, has been, remain, are</td>
</tr>
<tr>
<td><strong>cause</strong></td>
<td>construct, create, enact, establish, initiate, launch, set up, start, develop</td>
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<tr>
<td><strong>cause</strong> ((and X Y) share truth-value relationship-modifier diplomatic-relations)</td>
<td>normalize</td>
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<tr>
<td><strong>cause</strong> (X attribute false present exists)</td>
<td>eliminate</td>
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<tr>
<td><strong>cause</strong> (X location truth-value relationship-modifier Y)</td>
<td>deliver, deploy, direct to, move, extend, provide, give</td>
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<tr>
<td><strong>cause</strong> (X possess truth-value relationship-modifier Y)</td>
<td>donate, supply, contribute, give</td>
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<tr>
<td><strong>cause</strong> (X part-of truth-value relationship-modifier Y)</td>
<td>consolidate, integrate</td>
</tr>
<tr>
<td><strong>cause</strong> (X relationship false future Y)</td>
<td>deter, prevent</td>
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<tr>
<td><strong>close</strong></td>
<td>close</td>
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<td><strong>compete</strong></td>
<td>compete</td>
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<tr>
<td><strong>concern</strong></td>
<td>concern, worry</td>
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<td><strong>condemn</strong></td>
<td>condemn</td>
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<td>---------</td>
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<td><strong>condition</strong></td>
<td>necessary needs requires unless while without</td>
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<td><strong>confront</strong></td>
<td>confront deal with face</td>
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<tr>
<td><strong>consider</strong></td>
<td>entertain the notion examine reassess review study take account of explore</td>
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<tr>
<td><strong>consult</strong></td>
<td>consult discuss talk</td>
</tr>
<tr>
<td><strong>control</strong></td>
<td>control manipulate</td>
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<tr>
<td><strong>cooperate</strong></td>
<td>participate work with do our part</td>
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<tr>
<td><strong>decide</strong></td>
<td>choose decide make decision make judgment determine</td>
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<tr>
<td><strong>defend</strong></td>
<td>defend safeguard protect</td>
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<tr>
<td><strong>delay</strong></td>
<td>defer delay postpone</td>
</tr>
<tr>
<td><strong>demonstrate</strong></td>
<td>demonstrate prove</td>
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</table>
| **enforce**   | enforce  
enforce  
ensure  
guarantee |
|--------------|---------|
| **enhance**  | improve 
expand  
exaggerate  
intensify  
liberate  
modernize  
reinforce  
speed up  
step up  
tighten  
widen  
increase |
| **feel**     | feel    |
| **honor**    | abide by  
honor  
meet obligations  
respect  
observe  
break (false)  
transgress (false)  
vio late (false) |
| **if-then**  | if      
provided |
| **ignore**   | ignore  
lose sight of  
let pass |
| **Influence**| influence  
shape |
| **intervene**| intervene |
| **invade**   | invade |
| **is-a**     | is a    
member of |
<table>
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<tr>
<th>Action</th>
<th>Words</th>
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<tbody>
<tr>
<td><strong>know</strong></td>
<td>aware, believe, conclude, know, learn, look on as, not forget, realize, train, understand</td>
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<tr>
<td><strong>lead</strong></td>
<td>lead</td>
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<td><strong>limit</strong></td>
<td>constrain, curtail, minimize, restrict</td>
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<td><strong>limit</strong></td>
<td>limit</td>
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<tr>
<td><strong>location</strong></td>
<td>at, in, to</td>
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<tr>
<td><strong>maintain</strong></td>
<td>hold, maintain, preserve, sustain</td>
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<td><strong>meet</strong></td>
<td>meet</td>
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<tr>
<td><strong>monitor</strong></td>
<td>monitor, observe</td>
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<tr>
<td><strong>negotiate</strong></td>
<td>negotiate, conduct negotiations, undertake negotiations, talk</td>
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<td><strong>open</strong></td>
<td>open</td>
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<tr>
<td><strong>order</strong></td>
<td>instruct, order</td>
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<tr>
<td><strong>organize</strong></td>
<td>arrange, manage, marshal, mobilize, organize</td>
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<tr>
<td>part-of</td>
<td>component comprise</td>
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<td>perform</td>
<td>conduct</td>
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<td>engage in</td>
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<td>go forward</td>
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<td>press forward on</td>
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<td>proceed with</td>
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<td>belong</td>
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<tr>
<td>prefer</td>
<td>hope</td>
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<tr>
<td>(subject must be an agent other than the author, object must be a statement of possibility.)</td>
<td>like to see</td>
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<td>love to see</td>
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<td>would like</td>
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<td>propose</td>
<td>offer</td>
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<tr>
<td>propose (y visit X)</td>
<td>invite</td>
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<td>purchase</td>
<td>pay for</td>
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<td>ratify</td>
<td>ratify</td>
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<td><strong>reduce</strong></td>
<td>cut</td>
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<td><strong>release</strong></td>
<td>free</td>
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<td><strong>request</strong></td>
<td>ask</td>
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<td><strong>restore</strong></td>
<td>put back on course</td>
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<td><strong>sell</strong></td>
<td>export</td>
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<td><strong>separate</strong></td>
<td>separate</td>
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<tr>
<td><strong>share</strong></td>
<td>share</td>
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<td><strong>sign</strong></td>
<td>sign</td>
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<tr>
<td><strong>stop</strong></td>
<td>end</td>
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<td><strong>strategy</strong></td>
<td>best way</td>
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<tr>
<td><strong>support</strong></td>
<td>favor</td>
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<tr>
<td><strong>threaten</strong></td>
<td>intimidate</td>
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Table 7 continued

<table>
<thead>
<tr>
<th>use</th>
<th>resort to use exploit</th>
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<tbody>
<tr>
<td>verify</td>
<td>verify</td>
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<tr>
<td>visit</td>
<td>visit</td>
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<tr>
<td>vote-on</td>
<td>vote on</td>
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<tr>
<td>warrant-for</td>
<td>because for</td>
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<tr>
<td>withdraw</td>
<td>withdraw recall</td>
</tr>
<tr>
<td>yield-to</td>
<td>surrender yield to</td>
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Table 8. Truth-values

<table>
<thead>
<tr>
<th>true</th>
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<tbody>
<tr>
<td>false</td>
<td></td>
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<tr>
<td>partial</td>
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<tr>
<td>impossible</td>
<td>cannot happen unable to</td>
</tr>
<tr>
<td>possible</td>
<td>ability can prepared to ready to willing</td>
</tr>
<tr>
<td><strong>future</strong></td>
<td>going to be</td>
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<td>--------------------</td>
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<td></td>
<td>intend</td>
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<td>prospect</td>
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<td>will be</td>
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<td>would</td>
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<td><strong>past</strong></td>
<td>done</td>
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<td>has</td>
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<td><strong>present</strong></td>
<td>is being</td>
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<td></td>
<td>will continue</td>
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<td><strong>+goal</strong></td>
<td>aim</td>
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<td>dedication to</td>
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<td>desire</td>
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<td>eager to</td>
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<td>let</td>
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<td>make effort to</td>
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<td>mission</td>
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<td></td>
<td>must be</td>
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<td>objective</td>
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<td></td>
<td>priorities</td>
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<td>purpose</td>
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<td>pursue</td>
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<td>search</td>
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<td>secure</td>
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<td>seek</td>
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<td>strive</td>
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<td>try to</td>
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<td></td>
<td>want</td>
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<td></td>
<td>must</td>
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<tr>
<td></td>
<td>will undertake an effort to</td>
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<td></td>
<td>work for/ on/ to/ toward</td>
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<td></td>
<td>necessary</td>
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<tr>
<td><strong>hypothetical</strong></td>
<td>counterfactuals</td>
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<td></td>
<td>unless</td>
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<td></td>
<td>if</td>
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<td>until</td>
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<td><strong>normative</strong></td>
<td>should</td>
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<td></td>
<td>ought</td>
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<td></td>
<td>have a responsibility</td>
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<tr>
<td></td>
<td>obligation</td>
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</table>
Worked Examples

To further illustrate how the coding system is used, four worked examples are presented below. Each example is laid out as follows: the original text, each sentence labeled with capital letters is presented, then each sentences or portions thereof are labeled to indicate which portion of the sentence correspond to the parts of a data statement, i.e., subject, relationship, truth-value, modifier, and object. Following this the coding derived from the original texts is presented with labels corresponding to the capital letters applied to the original text.

Example #1

A: "Our government must at the same time be both competent and compassionate."
B: "We have already found a high degree of personal liberty, and we are now struggling to enhance equality of opportunity."
C: "Our commitment to human rights must be absolute, our laws fair, our national beauty preserved; the powerful must not persecute the weak, and human dignity must be enhanced."
:::Our government must at the same time be both competent and compassionate.

Subject; use and conjunction because of "both"

:::We have already found a high degree of personal liberty.

Subject; replace pronoun with the author's nation-state

Object

Complete relationship

and we are now struggling to enhance equality of opportunity.

Subject; replace pronoun with the author's nation-state

Relationship

Complete relationship
A: united-states attribute true +goal (and competent compassionate)  
B: united-states possess true present personal-liberty  
   united-states enhance true +goal equality-of-opportunity  
C: united-states-commitment-to-human-rights attribute true +goal absolute  
   united-states-laws attribute true +goal fair  
   united-states maintain true +goal national-beauty  
   powerful attack false +goal weak  
   united-states enhance true +goal human-dignity
Example #2

A: ;;; We are also prepared to explore with other nations new ways of being helpful on a wide range of institutional, human development, and technological approaches which might enable them to deal more effectively with the problems of the needy.

B: ;;; All of us have a special responsibility to help the poorest countries in the world as well as the poorest people in each of our countries.

C: ;;; I would like to add a word about private investment.

D: ;;; Your governments are understandably interested in setting rules that will encourage private investors to play an important role in your development.

E: ;;; We support your efforts and recognize that a new flexibility and adaptability are required today for foreign investment to be most useful in combining technology, capital management, and market experience to meet your development needs.

F: ;;; We will do our part in this field to avoid differences and misunderstandings between your government and ours.
A
Subject; "with other nations" indicates a compound subject that will require an "and" "we" can be replaced with author's nation-state this drops out because it does not add information to the coded statement

\[ \text{We are also prepared to explore with other nations new ways of being helpful on a wide range of} \]

\( \text{prepared indicates a truth-value of possible} \)

\( \text{Relationship: explore translates to "consider"} \)

\text{institutional, human development, and technological approaches}

Object; could be treated as a compound object, but this would produce three separate statements and there is nothing in the text to suggest that they are thought of separately

\text{Object of strategy relationship}

Subject; replace with "other nations"

\( \text{which might enable them to deal more effectively with the problems of the needy.} \)

\( \text{Relationship; "reduce" because dealing with problems usually means to reduce or eliminate them} \)

\( \text{indicates that a strategy relationship exists} \)

\( \text{indicates modifier of +goal} \)

\text{Object}

\text{Subject of strategy relationship}

B
Subject; with reference to the previous sentence this becomes (and united-states other-nations)

\( \text{Relationship; assist} \)

\( \text{Indicates a normative modifier} \)

\( \text{All of us have a special responsibility to help the poorest countries in the world as well as the poorest people in each of our countries.} \)

\( \text{Indicates that the statement is also true for the second object} \)

\text{Object}
The first codable statement from B is a warrant for A and should be coded as such, the second is an independent statement.

A & B:
(and united-states other-nations) assist true normative poorest-people-in-each-of-our-countries

((and united-states other-nations) assist true normative poorest-countries-in-the-world)
warrant-for true present
((other-nations reduce true +goal problems -of-the-needy)
strategy true present
((and united-states other-nations) consider possible present institutional-human-development
-and-technological-approaches))

C: NOT CODED

D

Subject; refer to previous sentences to get other-nations, if we knew the audience we could be more specific.

Suggests a +goal

;;;Your governments are understandably interested in setting.

Object of strategy relationship

Object of cause

Suggests a goal/strategy statement

rules that will encourage private investors to play an important role in your development

Subject of enhance

Relationship; enhance

Object of enhance; other-nations-development, again, if we knew the audience we could specify

Subject of strategy relationship
Object: refers to previous sentence

<table>
<thead>
<tr>
<th>Complete relationship</th>
</tr>
</thead>
</table>

Subject of condition: the condition statement must have a statement as object, and if something is required, then attribute exist is suggested

<table>
<thead>
<tr>
<th>Relationship; &quot;required&quot; indicates a condition relationship</th>
</tr>
</thead>
</table>

and recognize that a new flexibility and adaptability are required today for

<table>
<thead>
<tr>
<th>This drops out because it is just the author asserting something</th>
</tr>
</thead>
</table>

Subject of condition

<table>
<thead>
<tr>
<th>Indicates hypothetical modifier</th>
</tr>
</thead>
</table>

foreign investment to be most useful in combining

<table>
<thead>
<tr>
<th>Subject of reduce</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>technology, capital management, and market experience</th>
</tr>
</thead>
</table>

Object: each of these is an object of "combining," but there is nothing they are being combined into which suggests that "combining" indicates a part-of relationship with foreign investment as the subject

<table>
<thead>
<tr>
<th>Relationship; to meet needs suggests reduce</th>
</tr>
</thead>
</table>

Object of reduce

<table>
<thead>
<tr>
<th>3 complete relationships</th>
</tr>
</thead>
</table>

Object; refers to foreign-investment from previous sentence

Subject; united-states

;:::We will do our part in this field to

Relationship; "will do our part" suggests cooperate in the future

"to" indicates a goal/strategy pair

Object of strategy relationship

truth-value; false with attribute of exists

Relationship; "between" suggests share

avoid differences and misunderstandings between your government and ours.

Object of share

Subject of share; this will be compound (and united-states other-nations)

Subject of strategy relationship

D: (private-investors enhance true +goal other-nations-development) strategy true present
(other-nations cause true +goal rules-that-will-encourage-private-investors)

E: united-states support true present
(other-nations cause true +goal rules-that-will-encourage-private-investors)
(foreign-investment + true hypothetical other-nations-development) condition true present
(flexibility-and-adaptibility attribute true hypothetical exist)
technology part-of true present foreign-investment
capital-management part-of true present foreign-investment
market-experience part-of true present foreign-investment

F: ((and united-states other-nations) share false +goal differences-and-misunderstandings) strategy true present
(uniited-states cooperate true future foreign-investment)
Example #3

A:;;In the life of the human spirit, words are action, much more so than many of us may realize who live in countries where freedom of expression is taken for granted.
B:;;The leaders of totalitarian nations understand this very well.
C:;;The proof is that words are precisely the action for which dissidents in those countries are being persecuted.
D:;;Nonetheless, we can already see dramatic, worldwide advances in the protection of the individual from the arbitrary power of the state.
E:;;For us to ignore this trend would be to lose influence and moral authority in the world.
F:;;To lead it will be to regain the moral stature that we once had.
G:;;The great democracies are not free because we are strong and prosperous.
H:;;I believe we are strong and influential and prosperous because we are free.

A

This is all that gets coded from this sentence. One may be tempted to code other info, but it does not really add new information.

;;In the life of the human spirit, words are action, much more so than many of us may realize who live in countries where freedom of expression is taken for granted.

B

Subject

Object: refers to statement taken from previous sentence

;;;The leaders of totalitarian nations understand this very well.

Relationship: know
C

Object of perform

Relationship: action suggests perform

The proof is that words are precisely the action for which

Indicates warrant for previous sentence

Relationship: cause (subject is perform statement which is discrete)

Subject of perform and object of attack

Relationship: attack, the subject of attack is leaders-of-totalitarian-nations from the previous sentence. The attack statement is the object of the cause relationship.

dissidents in those countries are being persecuted.

Modifier: present, also indicates passive voice that should be changed to active

D

Nonetheless, we can already see dramatic,

Indicates: attribute true present exist

worldwide advances in the protection of the individual from the arbitrary power of the state.

Subject of attribute

E

Subject of if-then

Indicates hypothetical modifier

Relationship; ignore

Relationship; if-then

Object

;For us to ignore this trend would be to lose influence and moral authority in the world.

Subject: from the following sentences we can tell that this is great-democracies

Object: refers to subject of previous statement

Relationship; lose in this case suggests possess with a false truth-value, subject is great-democracies
F

Relationship: lead, with subject of great-democracies

\[ \text{To lead it will be to regain the moral stature that we once had.} \]

Object: refers to subject of D, previous but one sentence

Relationship: possess with subject of great-democracies

Subject of if-then

Object of if-then

G

Relationship: + (subject is a relationship not an agent and the relationship appears to be proportionate) with truth-value; false

\[ \text{The great democracies are not free because we are strong and prosperous.} \]

Subject, great-democracies

Relationship, attribute

Object; could be either compound or singular, in this case its is compound because in the following sentence each of three attributes is separated with and suggesting conceptually distinct items. This is different from #2; A where commas are used.

Object of +

Subject of +
"I believe we are strong and influential and prosperous because we are free."
A: words is-a true present action
B & C:
((dissidents-of-totalitarian-nations perfront true present words)
cause true present
(leaders-of-totalitarian-nations attack true present dissidents-of-totalitarian-nations))
warrant-for true present
(leaders-of-totalitarian-nations know true present (words is-a true present action))
D: worldwide-advances-in-the-protection-of-the-individual-from-the-arbitrary-power-of-the-state
attribute true present exist
E: (great-democracies ignore true hypothetical
worldwide-advances-in-the-protection-of-the-individual-from-the-arbitrary-power-of-the-state)
if-then true present
(great-democracies possess false hypothetical influence-and-moral-authority-in-the-world)
F: (great-democracies possess true hypothetical moral-stature)
worldwide-advances-in-the-protection-of-the-individual-from-the-arbitrary-power-of-the-state)
if-then true present
(great-democracies possess false hypothetical moral-stature)
G: (great-democracies attribute true present strong)
+ false present
(great-democracies attribute true present free)
(great-democracies attribute true present prosperous)
+ false present
(great-democracies attribute true present prosperous)
H: (great-democracies attribute true present prosperous)
+ true present
(great-democracies attribute true present prosperous)
(great-democracies attribute true present free)
+ true present
(great-democracies attribute true present prosperous)
(great-democracies attribute true present prosperous)
+ true present
(great-democracies attribute true present prosperous)
Example #4

NOTE: This is a speech to the UN so "we" can be replaced with UN-countries

A: ...Unless we establish a code of international behavior in which the resort to violence becomes increasingly irrelevant to the pursuit of national interests, we will crush the world's dreams for human development and the full flowering of human freedom.

B: ...We have already become a global community, but only in the sense that we face common problems and we share for good or evil a common future.

C: ...In this community, power to solve the world's problems, particularly economic and political power, no longer lies solely in the hands of a few nations.

D: ...Power is now widely shared among many nations with different cultures and different histories and different aspirations.

E: ...The question is whether we will allow our differences to defeat us or whether we will work together to realize our common hopes for peace.

F: ...Today I want to address the major dimensions of peace and the role the United States intends to play in limiting and reducing all armaments, controlling nuclear technology, restricting the arms trade, and settling disputes by peaceful means.
Unless we establish a code of international behavior in which the resort to violence becomes increasingly irrelevant to the pursuit of national interests, normally indicates future modifier, but because this is an if-then pair the modifier is hypothetical.

we will crush the world’s dreams for human development

Object to "crush"

Subject; UN-countries

Object of 1st if-then relationship

Relationship; cause

Truth-value; true

Modifier; hypothetical, followed by an attribute statement with truth-value of false and an object of exist

and the full flowering of human freedom.

Object of 2nd if-then relationship

Object to "crush"
Subject; UN-countries

Modifier; present, action started in the past, but is continuing

"We have already become a global community,"

Relationship; part-of, "become" suggests attribute, but global-community is not an adjective

Object of two warrant-for statements

Subject; UN-countries

Object

but only in the sense that we face common problems

Indicates that following items are warrants

Relationship; confront

Subject of 1st warrant-for

Relationship; share

and we share for good or evil a common future.

Subject; UN-countries

Object of share

Subject of 2nd warrant-for
C

Object of share

;;; In this community, power to solve the world's problems, particularly economic and political power;

Truth-value; false

no longer lies solely in the hands of a few nations.

Relationship; share, mutual possession

Subject of share

Components of the Object and therefore subjects of part-of relationships with "power-to-solve.." as the subject

D

Object; refers to object of previous sentence

Relationship; share

;;; Power is now widely shared among many nations

Subject; many-nations

This drops out it does not really add any new information.

with different cultures and different histories and different aspirations.
The question is whether... Indicate hypothetical modifier, and also that the statement is a choice, i.e., relationship: decide with an or conjunction.

Subject of allow and also of decide UN-countries Relationship; allow Object of allow one item in or conjunction

we will allow our differences to defeat us

Subject; UN-countries-differences Relationship; Object of - one item in or conjunction

or whether we will work together to realize our common hopes for peace.

Subject of cooperate: UN-countries Relationship; cooperate Object of cooperate second item in or conjunction

Modifier; +goal
This all drops out because it refers only to today's speech and does say what the dimensions of peace are.

:::Today I want to address the major dimensions of peace and the role

Subject + goal

the United States intends to play in limiting and reducing all armaments,

Relationship; reduce

Object of "reducing"

Complete relationship

Relationship; limit with United-states as subject, control would be another choice, but the sense here is restrict etc.

controlling nuclear technology, restricting the arms trade.

Object of limit

Complete relationship

Object of limit

Suggests relationship use with United-states as the subject

and settling disputes by peaceful means

Object of "settling" Object of use

Complete relationship

Relationship; reduce with united-states as subject; stop would be another choice but stop is used mainly for processes/actions.
A: (UN-countries cause true hypothetical
code-of-international-behavior-in-which-the-resort-to-violence-
becomes-increasingly-irrelevant-to-the-pursuit-of-national-interests)
if-then true present
(UN-countries cause true hypothetical (human-development attribute false hypothetical exist))
(UN-countries cause false hypothetical
code-of-international-behavior-in-which-the-resort-to-violence-
becomes-increasingly-irrelevant-to-the-pursuit-of-national-interests)
if-then true present
(UN-countries cause true hypothetical (human-freedom attribute false hypothetical exist))
B: (UN-countries confront true present common-problems)
  warrant-for true present
  (UN-countries part-of true present global-community)
  (UN-countries share true present common-future)
  warrant-for true present
  (UN-countries part-of true present global-community)
C: few-nations share false present power-to-solve-the-worlds-problems
economic-power part-of true present power-to-solve-the-worlds-problems
political-power part-of true present power-to-solve-the-worlds-problems
D: many-nations share true present power-to-solve-the-worlds-problems
E: UN-countries decide true future (or UN-countries allow true hypothetical
  (UN-countries-differences - true hypothetical UN-countries))
  (UN-countries cooperate true +goal peace)
F: United-states reduce true +goal armaments
  United-states limit true +goal nuclear-technology
  United-states limit true +goal arms-trade
  (United-states reduce true +goal disputes)
  strategy true present
  (United-states use true +goal peaceful-means)
APPENDIX B

WORLDVIEW CODE

;;; WORLDVIEW

;;; Belief system simulation using Young's (1993) coding scheme.
;;; Michael D. Young

;;; filename = Object Worldview.cl
;;; last revision 4/11/94

;;; This file contains routines for:
;;; - the construction of cognitive maps from data files
;;; - the modification of cognitive maps
;;; - problem representation based reasoning simulations using the maps.
;;; - structural and comparative measurement of stored cognitive maps
;;; - graphic display of cognitive maps
;;; - saving displayed graphs to PICT files.

;;; ***** COPYRIGHT NOTICE *****
;;; This source code is the property of Michael D. Young.
;;; Support for the development of an earlier version of this program was provided
;;; by a Dissertation Fellowship provided to the author by a grant from the National
;;; Science Foundation (DIR-9113599) to the Mershon Center Research Training Group on
;;; The Role of Cognition in Collective Political Decision Making at The Ohio State
;;; University.

;;; Permission is granted for any non-commercial use of this code on condition that
;;; the complete text of this copyright notice appear in all copies of the source
;;; produced.
;;; Modifications should be noted by appropriate documentation of the source.
;;; ***** END OF COPYRIGHT NOTICE *****
(setf *save-definitions* t)  ;; instructs compiler to save function definitions
                           ;; for use with menu commands.
(defvar *file-list*      ;; file list for batch-build
  (list
   "CCL:WorldView;Data Files;Carter 1/20/77"
   "CCL:WorldView;Data Files;Carter 3/17/77"
   "CCL:WorldView;Data Files;Carter 4/14/77"
   "CCL:WorldView;Data Files;Carter 5/22/77"
   "CCL:WorldView;Data Files;Carter 7/21/77"
   "CCL:WorldView;Data Files;Carter 10/4/77"
   "CCL:WorldView;Data Files;Carter 11/2/77"
   "CCL:WorldView;Data Files;Carter 1/4/78"
   "CCL:WorldView;Data Files;Carter.19780119"
   "CCL:WorldView;Data Files;Carter 1/19/78"
   "CCL:WorldView;Data Files;Carter 3/17/78"
   "CCL:WorldView;Data Files;Carter 4/1/78"
   "CCL:WorldView;Data Files;Carter 6/7/78"
   "CCL:WorldView;Data Files;Carter 9/18/78"
   "CCL:WorldView;Data Files;Carter 10/1/78"
   "CCL:WorldView;Data Files;Carter 1/23/79"
   "CCL:WorldView;Data Files;Carter.19790125"
   "CCL:WorldView;Data Files;Carter 2/20/79"
   "CCL:WorldView;Data Files;Carter 1/4/80"
   "CCL:WorldView;Data Files;Carter 1/23/80"
   "CCL:WorldView;Data Files;Carter 2/19/80"
   "CCL:WorldView;Data Files;Carter 4/10/80"
   "CCL:WorldView;Data Files;Carter 5/9/80"
   "CCL:WorldView;Data Files;Carter 8/21/80"))

;; Define allowed relationships.

(defvar *relations*      (list
   ' +  '-  '<  '>  'accept  'allow  'assert  'assist  'attack  'attribute
   'cause  'close  'compete  'concern  'condemn  'condition  'confront  'consider
   'consult  'control  'cooperate  'decide  'defend  'delay  'demonstrate
   'enforce  'enhance  'feel  'honor  'if-then  'ignore  'impose  'influence
   'intervene  'invade  'is-a  'know  'lead  'limit  'location  'maintain  'meet
   'monitor  'negotiate  'open  'order  'organize  'part-of  'perform  'possess
   'prefer  'propose  'purchase  'ratify  'reduce  'release  'request  'resist
   'restore  'sell  'separate  'share  'sign  'stop  'strategy  'support
   'threaten  'use  'verify  'visit  'vote-on  'warrant-for  'withdraw  'yield-to))
;;; Define allowed truth-values

(defun *truth-values*
  (list
    'true
    'false
    'partial
    'impossible
    'possible))

;;; Define allowed modifiers

(defun *modifiers*
  (list
    'future
    'past
    'present
    '+goal
    'hypothetical
    'normative))

(defun *synonym-list* () ;; list to keep synonyms.
  (defvar *concepts* nil) ;; list of active concept conjunction instances.
  (defvar *conjunctions* nil) ;; list of active conjunction instances.
  (defvar *labels* nil) ;; list of active concept labels for interface.
  (defvar *relationships* nil) ;; list of active relationships

;;; Define node class hierarchy for building cognitive maps.

;;; Wv-node is the super class for all the object types in the class hierarchy used for
;;; creating and modifying cognitive maps. The other classes inherit the characteristics
;;; of this class in addition to the characteristics defined exclusively for that class.
;;; Thus instances of the class “concept” have three slots: label, subject-of, and
;;; object-of inherited from the node class.
;;; Each slot has an accessor, used to update the value of the slot, an
;;; initarg used to set the initial value of the slot, and the value of
;;; the slot is constrained to its type.

(defun wv-node ()
  ((label :accessor label :initarg :label :type symbol)
   (subject-of :accessor subject-of :initarg :subject-of :type list)
   (object-of :accessor object-of :initarg :object-of :type list)
   (font :accessor font :initarg :font :initform ("Monaco" 9 :plain))))

(defun concept (wv-node) ()
  (defclass concept (wv-node)
    ((items :accessor items :initarg :items :type list))))
(defclass relationship (wv-node)
  ((subject :accessor subject :initarg :subject :type node)
   (object :accessor object :initarg :object :type node)
   (salience :accessor salience :initarg :salience :type ratio)
   (truth-value :accessor truth-value :initarg :truth-value :type symbol)
   (modifier :accessor modifier :initarg :modifier :type symbol)
   (font :accessor font :initarg :font :initform '("Monaco" 9 :bold))))

(defclass cog-map ()
  ((concepts :accessor concepts :initarg :concepts :type list)
   (relationships :accessor relationships :initarg :relationships :type list)
   (conjunctions :accessor conjunctions :initarg :conjunctions :type list)
   (label-list :accessor label-list :initarg :label-list :type list)))

;;; The objects and methods defined below are used in the graphical
;;; display of cognitive maps.

(defun test-node (standard-node)
  ()
  (:documentation "a test node"))

(defun node-name ((node test-node))
  (name (node-object node)))

(defun node-font ((node test-node))
  (font (node-object node)))

(defun name ((node wv-node))
  (label node))

(defun name ((node relationship))
  (concatenate 'string
    ("(" (string (label node))
    ",") (string (truth-value node))
    " " (string (modifier node))
    ")")))

(defun find-subnodes ((node test-node))
  (children (node-object node)))

(defun children ((node wv-node))
  (subject-of node))

(defun children ((node relationship))
  (cons (object node) (subject-of node))))
;;; The first set of routines constructs and saves cognitive maps.

;;; BUILD is the procedure for the construction of data items that
;;; represent nodes in a semantic net representation of a cognitive map.
;;; build reads data from a preformatted file, directs the processing
;;; of data.

(defun build ()
  (setf *concepts* nil)
  (setf *conjunctions* nil)
  (setf *relationships* nil)
  (setf *labels* nil)
  (with-open-file (port (choose-file-dialog :directory "CCL:WorldView:Data files;" :button-string "Build Map") :direction :input)
    (format t "~%":Building map from ~S...
      (subseq (format nil "~S" port) 35 (- (length (format nil "~S" port)) 2)))
    (let* ((EOF-Indicator 'EOF$)
      (LABELA (SYNONYM? (read port nil EOF-indicator) *SYNONYM-LIST*))
      (loop until
        (eq LABELA EOF-indicator)
        do
        (let* ((relation (read port))
          (TRUTH-VALUE (read port))
          (MODIFIER (read port))
          (LABELB (SYNONYM? (read port) *SYNONYM-LIST*))
          (_FORMAT T "~%~S~S~S~S" LABELA relation truth-value modifier LABELB)
          (TM(X LABELA relation truth-value modifier LABELB))
          (setf LABELA (read port nil EOF-indicator))))))

;;; sort *labels* alphabetically
(setf *labels* (sort *labels* #'string-lessp))
(format t "Done!"))

(defun batch-build ()
  (format t "~%Running .... ")
  (dolist (filename *file-list*)
    (setf *concepts* nil)
    (setf *conjunctions* nil)
    (setf *relationships* nil)
    (setf *labels* nil)
    (with-open-file (port filename :direction :input)
      (format t "~%Building map from ~S...
        (subseq (format nil "~S" port) 35 (- (length (format nil "~S" port)) 2)))
      (let* ((EOF-indicator 'EOF$)
        (LABELA (SYNONYM? (read port nil EOF-indicator) *SYNONYM-LIST*))
        (loop until
          (eq LABELA EOF-indicator)
          do
          (let* ((relation (read port))
            (TRUTH-VALUE (read port))
            (MODIFIER (read port))
            (LABELB (SYNONYM? (read port) *SYNONYM-LIST*))
            (FORMAT T "~%~S~S~S~S" LABELA relation truth-value MODIFIER LABELB)
            (TM(X LABELA relation truth-value MODIFIER LABELB))
            (setf LABELA (read port nil EOF-indicator))))))

;;; Calculates the number of occurrences of a certain concept
(setf *concepts* (append *concepts* (read port nil EOF-indicator) *SYNONYM-LIST*))
(format t "Occurrence of ~S: ~D")
(format t "~%" filename)
(setf EOF-indicator 'EOF$)
)
(truth-value (read port))
(modifier (read port))
(labelb (synonym? (read port) *synonym-list*)))
;;;; (format t "~%~S ~S ~S ~S" labela relation truth-value modifier labelb)
(tms labela relation truth-value modifier labelb))
(setf labela (read port nil eof-indicator)))))))

;;;; sort *labels* alphabetically
;;; (setf *labels* (sort *labels* #string-lessp))

;;;; (directed-walk (tms 'soviet-union 'invade 'true 'present 'afghanistan))
;;;; (measure-map)

(format t "~%The most salient relationship is ~%")
(print-info (most-salient *relationships*))
)
(format t "Done!"))

(defun cumulative-build ()
(format t "~%Running .... ")
(setf *concepts* nil)
(setf *conjunctions* nil)
(setf *relationships* nil)
(setf *labels* nil)
(dolist (filename *file-list*)
 (with-open-file (port filename :direction :input)
 (format t "~%~%Building map from ~S...")
 (subseq (format nil "~S" port) 35 (- (length (format nil "~S" port)) 2)))
(let* ((eof-indicator "$eof$")
 (labela (synonym? (read port nil eof-indicator) *synonym-list*)))
(loop until
 (eq labela eof-indicator)
 do
 (let* ((relation (read port))
 (truth-value (read port))
 (modifier (read port))
 (labelb (synonym? (read port) *synonym-list*)))
 ;; (format t "~%~S ~S ~S ~S" labela relation truth-value modifier labelb)
 (tms labela relation truth-value modifier labelb))
 (setf labela (read port nil eof-indicator))))))

;;;; sort *labels* alphabetically
;;; (setf *labels* (sort *labels* #string-lessp))
;;;; (directed-walk (tms 'soviet-union 'invade 'true 'present 'afghanistan))
(measure-map)
)
(format t "Done!")
;;; NEW-CONCEPT constructs a new node whose label slot holds concept, 
;;; and adds the new node to the active node list *concepts*

(defun new-concept (label)
  (let ((concept (make-instance 'concept :label label :subject-of () :object-of ()))))
  (setf *labels* (cons label *labels*))
  (setf *concepts* (cons concept *concepts*))
  (return-from new-concept concept)))

;;; NEW-RELATIONSHIP

(defun new-relationship (relation truth-value modifier concept1 concept2)
  (let ((relationship (make-instance 'relationship
                           :label relation :truth-value truth-value
                           :modifier modifier :subject concept1
                           :object concept2 :salience 1
                           :subject-of () :object-of ()))))
  (setf *relationships* (cons relationship *relationships*))
  (setf (subject-of concept1) (cons relationship (subject-of concept1)))
  (setf (object-of concept2) (cons relationship (object-of concept2)))
  (if (and (eq relation 'warrant-for)
            (typep concept2 'relationship))
      (incf (salience concept2)))
  (return-from new-relationship relationship)))

;;; NEW-CONJUNCTION

(defun new-conjunction (label-and-items)
  (let ((conjunction (conjunction? label-and-items *conjunctions*)))
    (cond (conjunction
            (return-from new-conjunction conjunction))
      (t
       (setf conjunction (make-instance 'conjunction
                                   :label (car label-and-items)
                                   :items ()
                                   :object-of ()
                                   :subject-of ()))
       (dolist (item (cdr label-and-items))
        (let ((item2 (expand (synonym item *synonym-list*))))
          (setf (items conjunction) (cons item2 (items conjunction)))
          (setf (object-of conjunction) (cons item2 (object-of conjunction)))
          (setf (subject-of item2) (cons conjunction (subject-of item2)))
          (setf *conjunctions* (cons conjunction *conjunctions*))
          (return-from new-conjunction conjunction)))))
(defun conjunction? (label-and-items conjunction-list)
  (cond ((null conjunction-list)
    (return-from conjunction? nil))
    (t
      (cond ((not (eq (car label-and-items) (label (car conjunction-list))))
        (conjunction? label-and-items (cdr conjunction-list)))
      (t
        (if (items-match? (cdr label-and-items) (items (car conjunction-list)))
          (return-from conjunction? (car conjunction-list))
          (conjunction? label-and-items (cdr conjunction-list))))))))

(defun items-match? (test-items match-items)
  (cond ((null test-items)
    (return-from items-match? t))
    ((not (member (expand (car test-items)) match-items))
      (return-from items-match? nil))
    (t
      (items-match? (cdr test-items) match-items))))

;;; concept? returns the concept with the label equivalent to label1
(defun concept? (label1 concept-list)
  (return-from concept? (find label1 concept-list :test #'equal :key #\label)))

;;; synonym?
;;; Predicate that returns a synonym if the concept has a known synonym.
(defun synonym? (label1 synonym-list)
  (cond ((null synonym-list) label1)
    ((member label1 (car synonym-list))
      (car (car synonym-list)))
    (t
      (synonym? label1 (cdr synonym-list))))))

;;; WALK-THE-MAP finds the concept "start" in the map "map", and then proceeds to
;;; traverse the map following the links with the greatest salience.
(defun walk-the-map() 
  (let ((start (car (select-item-from-list *labels* :window-title "Select a starting point" :selection-type :single))))
    (cond ((concept? start *concepts*)
      (format t "~-%Map walk starting from ~S" start) 
      (walk1 (concept? start *concepts*))
    (t
      (format t "~S is not an active concept in this map." start))))))
(defun walk1 (node)
   (cond ((typep node 'concept)
           (format t "~%S-->" (label node))
           (walk1 (car (sort (subject-of node) 'key #salience)))
           (typep node 'conjunction)
           (format t "~%S-->" (cons (label node) (item-labels (items node))))
           (walk1 (car (sort (subject-of node) 'key #salience)))
           (typep node 'relationship)
           (format t "~%S-->" (label node))
           (let ((next-node (object node)))
             (if (typep next-node 'relationship)
                 (walk2 next-node)
                 (walk1 next-node)))
           (t
            (format t "~%End of walk.")))
)

(defun walk2 (node)
   (cond ((typep node 'relationship)
           (format t "~%B")
           (print-info node)
           (format t " -->")
           (walk1 (car (sort (subject-of node) 'key #salience)))
           (t
            (format t "~%Error in walk2: ~S is not a relationship." node))))

;; removed from choose-policy prototype,
;; more like a linear reasoning model or improved walk than a goal based reasoning system
;; add into walk-the-map.
;; If a member of a class is the subject/object of a relationship,
;; be sure to check whether the class as subject/object of that relationship
;; is a goal, or has any if-thens, conditions, after checking
;; the specific concept.
;; if there are no if-thens, conditions, see if it is the
;; subject of a strategy relationship(s). If so go to the object of the
;; most salient strategy relationship.

(defun directed-walk (focus)
   (if (eq focus nil) (format t "~%End of walk.")
   (cond ((typep focus 'relationship)
           (cond

             ((and (eq (label focus) 'if-then)
                  (eq (truth-value focus) 'true)
                  (eq (modifier focus) 'present))
             (format t "~%")

             (print-info focus)

             (directed-walk (object focus))

             ;; if the relationship has a hypothetical modifier,
and if same exists with modifier present then next-focus is the
most salient both are subject-of, if same does not exist
use (subject focus) as next focus

(eq (modifier focus) 'hypothetical)
(format t "~%")
(print-info focus)
(let ((match-relationship (car (same? 'present
  (same? (truth-value focus)
   (similar-relationships?
    (subject focus)
    (label focus)
    (object focus))))))

(cond (match-relationship
   (directed-walk (most-salient (append (subject-of match-relationship)
     (subject-of focus))))))
(t
   (directed-walk (subject focus))))))

; if the relationship is a strategy,
; use the object of the strategy as the next focus.

(and (eq (label focus) 'strategy)
  (eq (truth-value focus) 'true)
  (eq (modifier focus) 'present))
(format t "~%")
(print-info focus)
(directed-walk (object focus)))

; if the relationship is a +goal,
; and it is not satisfied then
; select the most salient strategy as
; the next focus otherwise use (object focus)

(and (eq (modifier focus) '+goal)
  (find 'strategy (subject-of focus) :test #eq :key '#label))
(format t "~%")
(print-info focus)
(let ((match-relationship (car (same? 'present
  (same? (truth-value focus)
   (similar-relationships?
    (subject focus)
    (label focus)
    (object focus))))))

(cond ((not match-relationship)
   (format t "~%Goal not satisfied selecting strategy...")
   (directed-walk (most-salient (same? 'strategy (subject-of focus))))))
(t
(format t "~%Goal satisfied.")
(directed-walk (object focus)))

;; if the relationship is the subject of a relationship
;; then select the most salient and proceed from there.

((subject-of focus)
 (format t "~%")
 (print-info focus)
 (directed-walk (most-salient (subject-of focus))))

;; if the subject of the relationship is a member of a class,
;; substitute the class concept and proceed.

((find 'is-a (subject-of (subject focus)) :test #'eq :key #'label)
 (format t "~%")
 (print-info focus)
 (let* ((high-salience (most-salient (same? 'is-a (subject-of (subject focus))))))
     (print-info high-salience)
     (setf (subject focus) (object high-salience))
     (directed-walk focus)))

;; if the object of the relationship is a member of a class,
;; substitute the class concept and proceed.

((find 'is-a (subject-of (object focus)) :test #'eq :key #'label)
 (format t "~%")
 (print-info focus)
 (let* ((high-salience (most-salient (same? 'is-a (subject-of (object focus))))))
     (print-info high-salience)
     (setf (object focus) (object high-salience))
     (directed-walk focus)))

(t
 (format t "~%")
 (print-info focus)
 (directed-walk (object focus)))
)

((typep focus 'concept)
 (directed-walk (most-salient (subject-of focus))))

((typep focus 'conjunction)
 (directed-walk (most-salient (subject-of focus))))

(t
 (format t "~%Error ~S is not a valid structure for directed-walk" focus))
(defun print-info (node)
  (cond ((typep node 'relationship)
      (format t "("
        (cond ((typep (subject node) 'concept)
             (format t "~S" (label (subject node))))
               ((typep (subject node) 'relationship)
                (print-info (subject node)))
               ((typep (subject node) 'conjunction)
                (format t "~S" (cons (label (subject node))
                              (item-labels (items (subject node)))))))))
        (t
         (format t "~%Error in print-info: ~S has no subject." node)))
   (cond ((typep node 'relationship)
      (format t "~S ~S ~S" (label node) (truth-value node) (modifier node)))
   (cond ((typep (object node) 'concept)
      (format t "~S" (label (object node))))
               ((typep (object node) 'relationship)
                (print-info (object node)))
               ((typep (object node) 'conjunction)
                (format t "~S" (cons (label (object node))
                              (item-labels (items (object node)))))))))
        (t
         (format t "~%Error in print-info: ~S has no object." node)))
   (format t ")")
)

((typep node 'concept)
 (format t "~S" (label node)))

((typep node 'conjunction)
 (format t "~S" (cons (label node)
                        (item-labels (items node))))
 (t
  (format t "~%Error ~S is not a node!" node)))
)

(defun item-labels (item-list)
  (let ((label-list ()
            (dolist item item-list
                (setf label-list (cons (label item) label-list)))
            (return-from item-labels label-list)))
    ;; ADD-TO-MAP allows the user to add statements to the map which are not in the
    ;; source data file(s). Only small numbers of statements should be added in this
    ;; manner. Sets of statements in excess of three should be added to a renamed data file.
(defun add-to-map ()
  (let* (((input-string (get-string-from-user "Please enter a complete data statement; subject relationship truth-value modifier object:"))
        (subject nil)
        (relationship nil)
        (truth-value nil)
        (modifier nil)
        (object))
    (multiple-value-bind (item1 start2) (read-from-string input-string)
      (setf subject item1)
      (setf input-string (subseq input-string start2))
    (multiple-value-bind (item2 start3) (read-from-string input-string)
      (setf relationship item2)
      (setf input-string (subseq input-string start3))
    (multiple-value-bind (item3 start4) (read-from-string input-string)
      (setf truth-value item3)
      (setf input-string (subseq input-string start4))
    (multiple-value-bind (item4 start5) (read-from-string input-string)
      (setf modifier item4)
      (setf input-string (subseq input-string start5))
    (setf object (read-from-string input-string))))
  (tms subject relationship truth-value modifier object))
  (setf *labels* (sort *labels* #'string-lessp)))

;;; This set of routines calculates the four structural measures
;;; of belief systems/problem representations constructed by build,
;;; and compares the discrete differences between two maps.

(defvar *map1*)
(defvar *map2*)

;;; MEASURE-MAP calculates the structural measures of belief systems/problem
;;; representations: connectedness, dependency, size, and uniformity of salience.
;;; This function can only use a map already in memory.

(defun measure-map ()
  (let ((bridges 0)
        (links (length *relationships*))
        (subgraphs 1)
        (size (length *concepts*))
        (summed-salience 0)
        (salience-list nil)
        (max-salience 0)
        (min-salience 999))
    ;; calculate subgraphs
    ;; walks across entire graph using parents and children to calculate the number of
(let* ((active-graph (list (car *concepts*)))
       (master-list (cdr *concepts*))
       (already-checked ()
       (loop
         until (null master-list)
         do
         (cond ((null active-graph)
                 (incf subgraphs)
                 (setf active-graph (list (car master-list)))
                 (setf master-list (cdr master-list)))
         (t
          (let ((children-and-parents ()))
            (cond ((typep (car active-graph) 'concept)
                  (setf children-and-parents
                       (append (subject-of (car active-graph))
                               (object-of (car active-graph))))
                  ((typep (car active-graph) 'relationship)
                   (setf children-and-parents
                         (append (subject-of (car active-graph))
                                 (append (object-of (car active-graph))
                                         (append (list (object (car active-graph)))
                                                  (list (subject (car active-graph)))))))
                  ((typep (car active-graph) 'conjunction)
                   (setf children-and-parents
                         (append (subject-of (car active-graph))
                                 (append (object-of (car active-graph))
                                         (items (car active-graph))))))
                (dolist (child-or-parent children-and-parents)
                  (cond ((and (not (member child-or-parent active-graph))
                                         (not (member child-or-parent already-checked)))
                         (setf active-graph (append active-graph (list child-or-parent)))
                         (setf master-list (remove child-or-parent master-list)))
                  (setf already-checked (append already-checked (list (car active-graph))))
                  (setf active-graph (cdr active-graph))))))

;;;; calculate bridges
;;;; For each relationship, check the subject and object. If either the subject or
;;;; the object is a concept or and it is the subject-of and object-of only one
;;;; relationship then the relationship is a bridge. If both the subject and object
;;;; are relationships, then the relationship is not a bridge.
;;;; If either the subject or the object of the relationship
;;;; is a conjunction, and it is the subject-of and object-of only one relationship,
;;;; and all the items in the conjunction have an object-of list of length 1 and a
;;;; subject-of list of length 0 then the relationship is a bridge.

(dolist (test-relationship *relationships*)
  (if (or (and (typep (subject test-relationship) 'concept)
(eq 1 (+ (length (subject-of (subject test-relationship))))
  (length (object-of (subject test-relationship))))))
(and (typep (object test-relationship) 'concept)
  (eq 1 (+ (length (subject-of (object test-relationship))))
  (length (object-of (object test-relationship))))))
(and (typep (subject test-relationship) 'conjunction)
  (eq 1 (+ (length (subject-of (subject test-relationship))))
  (length (object-of (subject test-relationship))))))
(check-items (items (subject test-relationship)))
(and (typep (object test-relationship) 'conjunction)
  (eq 1 (+ (length (subject-of (object test-relationship))))
  (length (object-of (object test-relationship))))))
(check-items (items (object test-relationship)))
(incf bridges))

;;; calculate salience

(dolist (test-relationship *relationships*)
  (incf summed-salience (salience test-relationship))
  (setf salience-list (cons (salience test-relationship) salience-list)))
(dolist (salience-item salience-list)
  (if (> salience-item max-salience)
    (setf max-salience salience-item))
  (if (< salience-item min-salience)
    (setf min-salience salience-item)))

(format t "~%~% Bridges = ~S" bridges )
(format t "~%~% Relationships = ~S" links)
(format t "~%~% Subgraphs = ~S" subgraphs)
(format t "~%~% Structural measures:")
(format t "~% Size = ~S" size)
(format t "~% Dependency = ~S" (float (/ (bridges links) subgraphs)))
(format t "~% Connectedness = ~S" (float (/ links (+ size links))))
(format t "~% Mean Salience = ~S" (float (/ summed-salience links)))
(format t "~% Max Salience = ~S" max-salience)
(format t "~% Min Salience = ~S" min-salience)
(format t "~% S.D. of Salience = ~S"
  (let ((v 0))
    (dolist (salience-item salience-list)
      (incf v (expt (- salience-item (/ summed-salience links)) 2)))
    (sqrt (/ v (- links 1))))))

(defun check-items (item-list)
  (cond ((null item-list) t)
  ((and (eq 1 (length (object-of (car item-list))))
    (eq 0 (length (subject-of (car item-list)))))
    (check-items (cdr item-list)))
  (t)
(defun load-maps-1-&-2 ()
  (build)
  (setf *map1* (make-instance 'cog-map :concepts *concepts* :relationships
    *relationships* :conjunctions *conjunctions* :label-list *labels*))
  (build)
  (setf *map2* (make-instance 'cog-map :concepts *concepts* :relationships
    *relationships* :conjunctions *conjunctions* :label-list *labels*))

  (setf *concepts* nil)
  (setf *relationships* nil)
  (setf *conjunctions* nil)
  (setf *labels* nil))

;;; CONCEPT-COMPARISON calculates the discrete differences between two belief systems
;;; or problem representations: map1 and map2

(defun concept-comparison ()
  (multiple-value-bind (difference common-concepts unique-to-map1 unique-to-map2)
      (compare-concepts (label-list *map1*) (label-list *map2*))
    (declare (ignore difference))
    (format t "~%-% Common concepts: ~S" common-concepts)
    (format t "~%-% Concepts unique to map 1: ~S" unique-to-map1)
    (format t "~%-% Concepts unique to map 2: ~S" unique-to-map2)))

(defun compare-concepts (labels1 labels2)
  (let ((common-concepts nil)
         (unique-to-map1 nil)
         (unique-to-map2 nil))
    (dolist (concept labels1)
      (cond ((member concept labels2)
              (setf common-concepts (cons concept common-concepts)))
            (t
             (setf unique-to-map1 (cons concept unique-to-map1))))
    (dolist (concept labels2)
      (if (not (member concept labels1))
          (setf unique-to-map2 (cons concept unique-to-map2)))
      (values (+ (length unique-to-map1)
                 (length unique-to-map2))
              common-concepts
              unique-to-map1
              unique-to-map2)))
TRANSFORMATION-COST is a function that provides a Levenshtein difference measure based on the number of operations required to transform one cognitive map into another. The measure is based on the following "cost" of operations:

- add or delete a concept => 1
- add or remove a relationship => 1
- change relationship salience by 1 => 1

The decision to weight a change in relationship salience at one was made based on the assumption that adding a relationship is equivalent to changing the salience from zero to one.

(defun transformation-cost ()
  (format t "~%~%The Transformation cost for these two maps is ~S."
          (incongruence *map1* *map2*))

(defun incongruence (map1 map2)
  (multiple-value-bind (measure) (compare-concepts (label-list map1) (label-list map2))
    (let ((relationships1 (relationships map1))
          (relationships2 (relationships map2)))
      (dolist (relationship1 relationships1)
        (let ((relationship2 (relationship-match? (label relationship1)
                                                   (truth-value relationship1)
                                                   (modifier relationship1)
                                                   (subject relationship1)
                                                   (object relationship1)
                                                   relationships2)))
          (cond ((not (eq relationship2 nil))
                 (incf measure (abs (salience relationship1)
                                    (salience relationship2))))
                 (t
t)
          (setf relationships2 (remove relationship2 relationships2)))
      (dolist (relationship2 relationships2)
        (incf measure (salience relationship2)))
      (return-from incongruence measure)))

(defun relationship-match? (label1 truth-value1 modifier1 subject1 object1 target-relationships)
  (dolist (relationship target-relationships)
    (if (and (eq label1 (label relationship))
             (eq modifier1 (modifier relationship))
             (eq truth-value1 (truth-value relationship))
             (match? subject1 (subject relationship))
             (match? object1 (object relationship)))
      (return-from relationship-match? relationship)))
  (return-from relationship-match? nil))
(defun match? (node1 node2)
  (cond ((eq (label node1) (label node2))
      (cond ((typep node1 'conjunction)
         (let ((items1 (item-labels (items node1)))
               (items2 (item-labels (items node2))))
           (dolist (item items1)
             (if (member item items2)
                 (setf items2 (remove item items2))
                 (return-from match? nil)))
         (if (eq 0 (length items2))
             (return-from match? t)))))
      ((typep node1 'relationship)
       (if (and (eq (label node1) (label node2))
                 (eq (modifier node1) (modifier node2))
                 (eq (truth-value node1) (truth-value node2))
                 (match? (subject node1) (subject node2))
                 (match? (object node1) (object node2)))
         (return-from match? t)
         (return-from match? t)))))
  (t
   (return-from match? nil))))

(defun measure-incongruence ()
  (multiple-value-bind (difference common-concepts)
      (compare-concepts (label-list *map1*) (label-list *map2*))
      (declare (ignore difference))
    (let* ((focus (car (select-item-from-list common-concepts
                        :window-title "Select a concept as the focus of incongruence"
                        :selection-type :single)))
           (subgraph1 (build-subgraph (concept? focus (concepts *map1*))))
           (subgraph2 (build-subgraph (concept? focus (concepts *map2*))))
           (format t "-~-%Incongruence for subgraph focused on ~S equals ~S" focus
t        (incongruence subgraph1 subgraph2))))
)

(defun build-subgraph (focus)
  (cond (not (eq nil focus))
    (let* ((find-children-and-parents-list (list focus))
           (subgraph ()))
    (loop
      until (null find-children-and-parents-list)
    do
      (let ((children-and-parents ()))
        (cond ((typep (car find-children-and-parents-list) 'concept)
               (setf children-and-parents
)}
(append (subject-of (car find-children-and-parents-list))
  (object-of (car find-children-and-parents-list))))

((typep (car find-children-and-parents-list) 'relationship)
  (setf children-and-parents

    (append (subject-of (car find-children-and-parents-list))
      (append (object-of (car find-children-and-parents-list)))
      (append (list (object (car find-children-and-parents-list))))
      (list (subject (car find-children-and-parents-list)))))))))

((typep (car find-children-and-parents-list) 'conjunction)
  (setf children-and-parents

    (append (subject-of (car find-children-and-parents-list))
      (append (object-of (car find-children-and-parents-list)))
      (items (car find-children-and-parents-list)))))))

(dolist (child-or-parent children-and-parents)
  (cond ((and (not (member child-or-parent subgraph))
      (not (member child-or-parent find-children-and-parents-list)))
    (setf find-children-and-parents-list

      (append find-children-and-parents-list (list child-or-parent)))))))

(setf subgraph (append subgraph (list (car find-children-and-parents-list)))
  (setf find-children-and-parents-list (cdr find-children-and-parents-list))))

(let ((concepts ()

  (relationships ()

  (conjunctions ()

  (label-list ())

  (dolist (node subgraph)
    (cond ((typep node 'concept)

      (setf concepts (cons node concepts))
      (setf label-list (cons (label node) label-list)))
    ((typep node 'relationship)
      (setf relationships (cons node relationships)))
    ((typep node 'conjunction)
      (setf conjunctions (cons node conjunctions)))
    (t
      (format t "~%Error in build-subgraph.")))))))

(return-from build-subgraph (make-instance 'cog-map :concepts concepts
 :relationships relationships
 :conjunctions conjunctions
 :label-list label-list))))

(t
  (return-from build-subgraph nil))))

(defun all-incongruence ()
  (format t "~%Running .... ")
  (let ((files *file-list*))
    (loop until (< (length files) 2) do
      (setf *concepts* nil)
      (setf *conjunctions* nil)
(setq *relationships* nil)
(setq *labels* nil)
(with-open-file (port (car files) :direction :input)
  (format t "%-%-%Building map1 from %-S..."
    (subseq (format nil "%-S" port) 35 (- (length (format nil "%-S" port)) 2)))
(let* ((eof-indicator "eof")
  (labela (read port nil eof-indicator)))
  (loop until
    (eq labela eof-indicator)
    do
      (let* ((relation (read port))
        (truth-value (read port))
        (modifier (read port))
        (labelb (read port)))
        (tms labela relation truth-value modifier labelb))
      (setf labela (read port nil eof-indicator)))
  (setf *map1* (build-subgraph (expand (synonym? 'soviet-union *synonym-list*)))))

(dolist (file2 (cdr files))
  (setq *concepts* nil)
  (setq *conjunctions* nil)
  (setq *relationships* nil)
  (setq *labels* nil)
  (with-open-file (port file2 :direction :input)
    (format t "%-%-%-Building map2 from %-S...
      (subseq (format nil "%-S" port) 35 (- (length (format nil "%-S" port)) 2)))
    (let* ((eof-indicator "eof")
      (labela (read port nil eof-indicator)))
      (loop until
        (eq labela eof-indicator)
        do
          (let* ((relation (read port))
            (truth-value (read port))
            (modifier (read port))
            (labelb (read port)))
            (tms labela relation truth-value modifier labelb))
          (setf labela (read port nil eof-indicator)))
      (setf *map2* (build-subgraph (expand (synonym? 'soviet-union *synonym-list*))))
      (format t "%-%-Incongruence= %-S" (incongruence *map1* *map2*))
    (setf files (cdr files))
  (format t "Done!")))

;;;;LOAD-SYNONYM-LIST
;;;;this function loads a previously created synonym list from a file.

(defun load-synonym-list ()
  (with-open-file
    (port (choose-file-dialog :directory "CCL:WORLDVIEW;Synonym Lists;"
(button-string "Load")
:direction :input)
(format t "~%Loading synonyms from ~S...
(subseq (format nil "~S" port) 35 (- (length (format nil "~S" port)) 2)))
(eval (read port)))
(format t "~%Synonyms loaded!
))

;;; POLICY-CHOICE

(defun policy-choice ()

;;; Assumes input to be an accurate reflection of belief.

(let* ((input-string (get-string-from-user "Please enter a complete data statement; subject relationship truth-value modifier object."))
   (subject nil)
   (relationship nil)
   (truth-value nil)
   (modifier nil)
   (object nil))

;;; parse string from dialog box into a data statement

(multiple-value-bind (item1 start2) (read-from-string input-string)
   (setf subject (expand (synonym? item1 *synonym-list*))))
   (setf input-string (subseq input-string start2))
   (multiple-value-bind (item2 start3) (read-from-string input-string)
      (setf relationship item2)
      (cond ((not (member relationship *relations*))
         (format t "~%Error in input.
         (return-from policy-choice nil)))
         (setf input-string (subseq input-string start3))
   (multiple-value-bind (item3 start4) (read-from-string input-string)
       (setf truth-value item3)
       (cond ((not (member truth-value *truth-values*))
            (format t "~%Error in input.
            (return-from policy-choice nil)))
            (setf input-string (subseq input-string start4))
   (multiple-value-bind (item4 start5) (read-from-string input-string)
       (setf modifier item4)
       (cond ((not (member modifier *modifiers*))
             (format t "~%Error in input.
             (return-from policy-choice nil)))
             (setf input-string (subseq input-string start5))
   (setf object (expand (synonym? (read-from-string input-string) *synonym-
list*))))))))

;; Look for similar relationships that already exist in the dataset
;; if none exist, add the new information to the dataset and choose-policy
;;; from that starting point.
(format t "~%You have entered:~%")
(print-info subject)
(format t "~S ~S ~S " relationship truth-value modifier)
(print-info object)
(format t "~%Choosing policy response ....")
(choose-policy (tms subject relationship truth-value modifier object))
(format t "~%Policy Choice Complete!"))

;;; Truth Maintainence System
;;; A little routine with great aspirations. This essentially just looks at truth-values and
;;; modifiers to detect change in the cog. map under construction.
(defun tms (subject relationship truth-value modifier object)
  (let* ((subject (expand (synonym? subject *synonym-list*)))
          (object (expand (synonym? object *synonym-list*)))
          (similar-relationships (similar-relationships? subject relationship object)))
    (cond ((null similar-relationships)
           (return-from tms (handle-data subject relationship truth-value modifier object)))
          ((same? truth-value (same? modifier similar-relationships))
           (return-from tms (car (same? truth-value (same? modifier similar-relationships)))))
          (t
           (cond
              ;; If a similar relationship with the same modifier except hypothetical
              ;; has a different truth-value, change the truth-value as required.
              ((and (not (eq modifier 'hypothetical))
                 (car (same? modifier similar-relationships))
                 (not (eq truth-value (truth-value (car (same? modifier similar-relationships))))))
               (let ((matched-relationship (car (same? modifier similar-relationships))))
                 (cond ((or (eq truth-value 'true)
                            (and (eq truth-value 'partial)
                                 (not (eq (truth-value matched-relationship) 'true)))
                            (and (eq truth-value 'possible)
                                 (not (eq (truth-value matched-relationship) 'true))
                                 (not (eq (truth-value matched-relationship) 'partial)))
                            (and (eq truth-value 'false)
                                 (not (eq (truth-value matched-relationship) 'possible))
                                 (not (eq (truth-value matched-relationship) 'impossible)))
                             (eq truth-value 'impossible))
                   (format t "~%Change in established belief! ~%From: ~%To: ")
                   (print-info matched-relationship)
                   (setf (truth-value matched-relationship) truth-value)
                   (format t "~%to: ~")
                   (print-info matched-relationship)
                   (return-from tms matched-relationship)))))
          ((and (eq truth-value 'false)
(eq (truth-value matched-relationship) 'possible)
(return-from tms (handle-data subject relationship truth-value modifier object)))

(t
(return-from tms matched-relationship)))))

;; if a similar-relationship was present and becomes past
;; change the modifier and pass to policy-choice

((eq modifier 'past)
(cond ((car (same? truth-value (same? 'present similar-relationships)))
(let ((matched-relationship
    (car (same? 'present (same? truth-value similar-relationships)))))
  (format t "~%Change in established belief! ~%From: ")
  (print-info matched-relationship)
  (setf (modifier matched-relationship) 'past)
  (format t "~%to: ")
  (print-info matched-relationship)
  (return-from tms matched-relationship)))))

(t
(return-from tms (handle-data subject relationship truth-value modifier object)))))

;; Assumes that only simple data statements will be given as inputs,
;; ie, no compound subjects or objects.

(defun similar-relationships? (subject relation object)
  (let ((similar-relationships nil))
    (dolist (relationship *relationships*)
      (if (and (eq (label relationship) relation)
        (eq (subject relationship) subject)
        (eq (object relationship) object))
        (setf similar-relationships (cons relationship similar-relationships)))
    (return-from similar-relationships? similar-relationships)))

(defun same? (item1 relationship-list)
  (if (null relationship-list)
    (return-from same? nil))
  (let ((same-relationships ()))
    (cond ((member item1 *modifiers*)
      (dolist (relationship relationship-list)
        (if (eq (modifier relationship) item1)
            (setf same-relationships (cons relationship same-relationships)))
        (return-from same? same-relationships))
    ((member item1 *truth-values*)
      (dolist (relationship relationship-list)
        (if (eq (truth-value relationship) item1)
    (return-from same? same-relationships)))
(setf same-relationships (cons relationship same-relationships)))
(return-from same? same-relationships))

((member item1 *relations*)
 (dolist (relationship relationship-list)
   (if (eq (label relationship) item1)
     (setf same-relationships (cons relationship same-relationships)))
   (return-from same? same-relationships))))

(defun conditions-satisified? (condition-list)
  (cond ((null condition-list) t)
        (t
         (let ((satisified t))
           (dolist (condition-relationship condition-list)
             (if (not (or (eq (modifier (object condition-relationship)) 'present)
                         (eq (modifier (object condition-relationship)) 'past)))
               (setf satisified nil))
             (return-from conditions-satisified? satisified))))))

(defun choose-policy (focus)
  (cond ((typep focus 'node)
        (cond
          ;; if the relationship is a +goal, and it is not satisfied then
          ;; search for strategies, if any exist select the most salient
          ((and (typep focus 'relationship)
                 (eq (modifier focus) '+goal)
                 (not (car (same? 'present (same? (truth-value focus) (similar-relationships? (subject focus)
                                                        (label focus)
                                                        (object focus)))))))
            (goal-walk focus))
          (t
           ;; search for goals using breadth-first search, if an unsatisified goal is found
           ;; start a goal-walk.
           (let* ((find-children-and-parents-list (list focus))
                   (subgraph ()))
             (loop
t               until (null find-children-and-parents-list)
             do
               (let ((children-and-parents ()))
                 (cond ((typep (car find-children-and-parents-list) 'concept)
                        (setf children-and-parents
                              (append (subject-of (car find-children-and-parents-list))
                                      (object-of (car find-children-and-parents-list))))))))))
          (t
           ;; search for goals using depth-first search, if an unsatisified goal is found
           ;; start a goal-walk.
           (let* ((find-children-and-parents-list (list focus))
                   (subgraph ()))
             (loop
t               until (null find-children-and-parents-list)
             do
               (let ((children-and-parents ()))
                 (cond ((typep (car find-children-and-parents-list) 'concept)
                        (setf children-and-parents
                              (append (subject-of (car find-children-and-parents-list))
                                      (object-of (car find-children-and-parents-list)))))))))))))
((typep (car find-children-and-parents-list) 'relationship)
  (setf children-and-parents
    (append (subject-of (car find-children-and-parents-list))
      (append (object-of (car find-children-and-parents-list))
        (append list (object (car find-children-and-parents-list))))
      (list (subject (car find-children-and-parents-list))))))
((typep (car find-children-and-parents-list) 'conjunction)
  (setf children-and-parents
    (append (subject-of (car find-children-and-parents-list))
      (append (object-of (car find-children-and-parents-list))
        (items (car find-children-and-parents-list))))))
(dolist (child-or-parent children-and-parents)
  (cond
    ((and (typep child-or-parent 'relationship)
      (eq (modifier child-or-parent) '+goal)
      (not (car (same? 'present (same? (truth-value child-or-parent) (similar-relationships?))))
        (subject child-or-parent)
        (label child-or-parent)
        (object child-or-parent))))
    (goal-walk child-or-parent)
    (return-from choose-policy t))
  (and (not (member child-or-parent subgraph))
    (not (member child-or-parent find-children-and-parents-list)))
  (setf find-children-and-parents-list
    (append find-children-and-parents-list (list child-or-parent))))
  (setf subgraph (append subgraph (list (car find-children-and-parents-list))))
  (setf find-children-and-parents-list (cdr find-children-and-parents-list)))))
)

(t
  (format t "~% ~S is not a valid focus for policy choice!" focus)
  (return-from choose-policy nil))))

(defun batch-choose-policy ()
  (format t "~%Running .... ")
  (dolist (filename *file-list*)
    (setf *concepts* nil)
    (setf *conjunctions* nil)
    (setf *relationships* nil)
    (setf *labels* nil)
    (with-open-file (port filename :direction :input)
      (format t "~%~%Choosing policy from ~%~S ~%with 'soviet-union 'invade 'true 'present 'afghanistan as focus..."
        (subseq (format nil "~S" port) 25 (- (length (format nil "~S" port)) 2))))
    (let* ((eof-indicator '$eof$)
      (labela (syonym? (read port nil eof-indicator) *synonym-list*)))))
  (loop until
    (eq labela eof-indicator)
(let* ((relation (read port))
       (truth-value (read port))
       (modifier (read port))
       (labelb (synonym? (read port) *synonym-list*))
       (tms labela relation truth-value modifier labelb))
   (setf labela (read port nil eof-indicator))))

(choose-policy (tms 'soviet-union 'invade 'true 'present 'afghanistan)))

(format t "Done!"))

(defun cumulative-choose-policy ()
  (format t "~%Running .... ")
  (setf *concepts* nil)
  (setf *conjunctions* nil)
  (setf *relationships* nil)
  (setf *labels* nil)
  (dolist (filename *file-list*)
    (with-open-file (port filename :direction :input)
      (format t "~%~%Choosing policy from ~S ~%with 'soviet-union 'invade 'true
              'present 'afghanistan as focus...
      (subseq (format nil "~S" port) 35 (- (length (format nil "~S" port)) 2)))
      (let* ((eof-indicator "$eof$")
              (labela (synonym? (read port nil eof-indicator) *synonym-list*))
            (loop until
                (eq labela eof-indicator)
                do
                (let* ((relation (read port))
                       (truth-value (read port))
                       (modifier (read port))
                       (labelb (synonym? (read port) *synonym-list*))
                       (tms labela relation truth-value modifier labelb))
                (setf labela (read port nil eof-indicator))))))
      (choose-policy (tms 'soviet-union 'invade 'true 'present 'afghanistan)))
      (format t "Done!"))

backtracking if-then currently not in use

(defun choose-if-then (focus if-then-list)
  (cond ((null if-then-list)
         (choose-policy (object focus)))
    (t
     (let* ((high-salience (most-salient if-then-list))
            (next-relationship (object high-salience)))
       (format t "~%")
       (print-info high-salience)))
(cond ((and (eq (modifier next-relationship) 'hypothetical)
    (conditions-satisfied? (same? 'condition (subject-of next-relationship))))))
  (format t "~%")
  (print-info next-relationship)
  (setf (modifier next-relationship) 'present)
  (choose-policy next-relationship))
(t
  (format t "~%")
  (print-info next-relationship)
  (format t "~%Not all conditions satisfied, looking for another if-then...")
  (choose-if-then (remove high-saliency if-then-list)))
)))))

(defun goal-walk (focus)
  (cond ((or (not (typep focus 'relationship))
         (not (eq (modifier focus) '+goal)))
    (format t "~%Error argument to goal walk is not a +goal relationship!"))
  (t
    (format t "~%Goal found!~")
    (print-info focus)
    (let ((match-relationship (car (same? 'present
        (same? (truth-value focus)
        (similar-relationships?
        (subject focus)
        (label focus)
        (object focus))))))
      (cond ((not match-relationship)
        (format t "~%Goal not satisfied selecting strategy...~")
        (cond ((find 'strategy (subject-of focus) :test #eq :key #label)
          (let ((next-strategy (most-salient (same? 'strategy (subject-of focus)))))))
            (print-info next-strategy)
            (if (eq (modifier next-strategy) '+goal)
              (goal-walk next-strategy)))
      (t
        (format t "~%No strategies for this goal.~")
        (cond ((object-of focus)
            (print-info focus)
            (format t " is the object of:~%" focus)
            (print-info (car (object-of focus)))))))
    (t
      (print-info match-relationship)
      (format t "~%Goal satisfied!"))))))

(defun most-salient (relationship-list)
  (if (null relationship-list)
      (return-from most-salient nil))
  (let ((high-saliency-relationship (car relationship-list)))
    (if (true-value (match-relationship (strategy focus)))
      (cond ((search high-saliency-relationship))
        (let ((most-salient (first (search high-saliency-relationship))))
          (cond ((find 'goal high-saliency-relationship)
            (goal-walk (first (find 'goal high-saliency-relationship))))
          (t
            (goal-walk (first (search high-saliency-relationship)))))))
    (most-salient)))

(defun goal-walk (focus)
  (cond ((or (not (typep focus 'relationship))
         (not (eq (modifier focus) '+goal)))
    (format t "~%Error argument to goal walk is not a +goal relationship!"))
  (t
    (format t "~%Goal found!~")
    (print-info focus)
    (let ((match-relationship (car (same? 'present
        (same? (truth-value focus)
        (similar-relationships?
        (subject focus)
        (label focus)
        (object focus))))))
      (cond ((not match-relationship)
        (format t "~%Goal not satisfied selecting strategy...~")
        (cond ((find 'strategy (subject-of focus) :test #eq :key #label)
          (let ((next-strategy (most-salient (same? 'strategy (subject-of focus)))))))
            (print-info next-strategy)
            (if (eq (modifier next-strategy) '+goal)
              (goal-walk next-strategy)))
      (t
        (format t "~%No strategies for this goal.~")
        (cond ((object-of focus)
            (print-info focus)
            (format t " is the object of:~%" focus)
            (print-info (car (object-of focus)))))))
    (t
      (print-info match-relationship)
      (format t "~%Goal satisfied!"))))))
(dolist (relationship (cdr relationship-list))
  (cond ((eq nil high-salience-relationship)
       (setf high-salience-relationship relationship))
    (t
     (if (> (salience relationship)
       (salience high-salience-relationship))
       (setf high-salience-relationship relationship)))))
(return-from most-salient high-salience-relationship)))

;;; This code installs a menu "WorldView" at the right end of the menubar,
;;; all WorldView functions can be accessed by menu commands, and this is
;;; the suggested procedure.

#{(menu-install (MAKE-INSTANCE 'MENU
  :MENU-TITLE "WorldView"
  :MENU-ITEMS
LIST
  (MAKE-INSTANCE
    'MENU-ITEM
    :MENU-ITEM-TITLE
    "Load synonyms"
    :MENU-ITEM-ACTION
    #(LAMBDA NIL (load-synonym-list)))

(MAKE-INSTANCE
  'MENU-ITEM
  :MENU-ITEM-TITLE
  "Build a map"
  :MENU-ITEM-ACTION
  #(LAMBDA NIL (BUILD)))

(MAKE-INSTANCE
  'MENU-ITEM
  :MENU-ITEM-TITLE
  "Add to map"
  :MENU-ITEM-ACTION
  #(LAMBDA NIL (ADD-TO-MAP)))

(MAKE-INSTANCE
  'MENU-ITEM
  :MENU-ITEM-TITLE
  "Walk the map"
  :MENU-ITEM-ACTION
  #(LAMBDA NIL (WALK-THE-MAP)))

(MAKE-INSTANCE
  'MENU-ITEM
  :MENU-ITEM-TITLE
  "Structural Measures"
;;; Routines for graphing cognitive maps.

(defun graph-map ()
  (graph (make-root
    :graph-class 'geta-graphe-window
    :node-class 'test-node
    :layout :horizontal
    :window-title "test"
    :direction :positive
    :allow-duplicates nil))

(defun make-root ()
  (let ((root (make-instance 'wv-node :label 'root :subject-of ())))
    (dolist (concept (append *concepts* *conjunctions*))
      (cond ((null (object-of concept))
              (setf (subject-of root) (cons concept (subject-of root))))
            (setf (object-of concept) (cons root (object-of concept)))))))
(return-from make-root root))
#
(defun make-root ()
  (let ((root (make-instance 'wv-node :label 'root :subject-of ()))
        (us (concept 'united-states *concepts*))
        (su (concept 'soviet-union *concepts*))
        (setf (subject-of root) (cons us (subject-of root)))
        (setf (object-of us) (cons root (object-of us)))
        (setf (subject-of root) (cons su (subject-of root)))
        (setf (object-of su) (cons root (object-of su)))
        (return-from make-root root)))
#
(defmethod view-click-event-handler ((graph geta-grapher-window) where)
  (declare (ignore where))
  (let ((node (call-next-method))
        (when node
          (do-collapse graph node))))
  (setf *y-spacing* 10)
  (setf *x-spacing* 10)

;; Save graph to PICT file.
;; Adapted from geta-grapher code by by Gilles Serasset and Mathieu Lafourcade:
(defmethod save-graph-to-pict ((self geta-grapher-window) &optional (show-dialog? T))
  (declare (optimize (speed 3) (safety 0) (compilation-speed 0) (space 0)))
  (declare (ignore show-dialog?))

;; On défini une variable pour contenir le dessin.
(let
  (*geta-grapher-picture*
   (grapher-scroll-position (view-scroll-position (ccl::my-scroller self)))
   (grapher-window-size (view-size self)))

  (window-hide self)
  (set-view-size self (add-points @(20 20) (compute-field-size self))
  (set-view-scroll-position (ccl::my-scroller self) @((0 0))
  (setf (slot-value (slot-value self 'ccl::my-scroller) 'view-size)
        (compute-field-size self))

;; On regarde ce qui est dessiné dans le scroller de la fenêtre.
(start-picture (slot-value self 'ccl::my-scroller) )

;; On dessine.
(with-focused-view (slot-value self 'ccl::my-scroller)
  (node-print (slot-value self 'root-node)))
(setq *geta-grapher-picture* (get-picture (slot-value 'ccl::my-scroller)))

;; On l'imprime.
(oou::write-picture-to-file *geta-grapher-picture* (choose-new-file-dialog))

;; On restaure les settings.
(set-view-size self grapher-window-size)
(set-view-scroll-position (ccl::my-scroller self) grapher-scroll-position)
(window-select self)

;; Et enfin, on le libère.
(kill-picture *geta-grapher-picture*))

# In order to use the routines for graphical display and printing, the geta-grapher
package must be loaded, and WorldView should be loaded from inside the
package :geta-grapher

The geta-grapher package (available on cambridge.apple.com)
provides a set of classes which allows you to graphically display
any data structure which can be expressed as a tree or DAG (directed
acyclic graph). It is based on the grapher.lisp file from Apple Computer
and on the grapher.lisp file from Bill Anderson (University of Maryland).

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oodles-of-utils:brutal-utils:PICT-u.lisp must also be loaded.

oodles-of-utils (available on cambridge.apple.com)
is a large collection of MCL code to help access the
Mac ToolBox and create user interfaces. It requires MCL 2.0p1
or later. To learn more about them, read the documentation.

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APPENDIX C

SPEECHES BY PRESIDENT CARTER


4/14/77, Organization of American States (domestic), New World, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, 1977

5/22/77, Commencement, Notre Dame (domestic), US Foreign Policy, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, 1977

7/21/77, Southern Legislative Council (domestic), Problems That Face America Abroad, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, 1977 pages 1469-1477


1/19/78, Congress/United States-televised (domestic), State of the Union, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, 1978


9/18/78, Congress (domestic), Camp David Agreement, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, pages 1533-1537

10/1/78, International Chamber of Commerce (international), Responsibilities in an Interdependent World, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, pages 1689-1694


2/29/79, Georgia Institute Technology (domestic), Weekly Compilation of Presidential Documents, America's Role and Purpose in the World, Administration of Jimmy Carter, 1979 pages 300-306


2/19/80, American Legion (domestic), National Security, Weekly Compilation of Presidential Documents, Administration of Jimmy Carter, 1980 pages 344-349


BIBLIOGRAPHY


Alker, Hayward r. Jr., & Cheryl Christensen (1973), From Causal Modeling to Artificial Intelligence; the Evolution of a UN Peace-making Simulation.


DeJong, Gerald (1988) “An Introduction to Explanation Based Learning,”


Hudson, Valerie (1992c) “Foreign Policy Analysis” Brigham Young University mimeo.


Mefford, Dwain (1992) “Steps Toward Artificial Intelligence: Rule-Based, Case-Based and Explanation-Based Models of Politics,” in Valerie Hudson (ed.) *AI/IP.*


